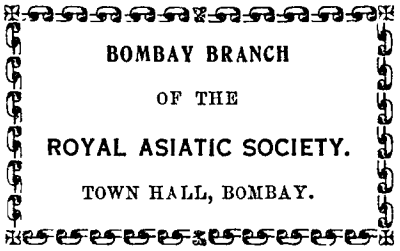
Agriculture Department,
Burma report,
1910-11 to 1914-15

00133917



Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ending the 30th June 1911

133917

RANGOON

OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, BURMA

1911

LIST OF AGENTS

FOR THE

SALE OF GOVERNMENT PUBLICATIONS.

IN INDIA:

THACKER, SPINK & Co., Calcutta and Simla.
W. NEWMAN & Co., Calcutta.
THACKER & Co., Bombay.
HIGGINBOTHAM & Co., Madras.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.

IN ENGLAND:

HENRY S. KING & Co., 65, Cornhill, E.C., London.
CONSTABLE & Co., 10, Orange Street, Leicester Square, W. C.
KEGAN PAUL, TRENCH, TRÜBNER & Co., 43, Gerrard Street, Soho, London, W.
BERNARD QUARITCH, 11, Grafton Street, New Bond Street, W.
P. S. KING & SON, 2 & 4, Great Smith Street, Westminster, London, W.S.
GRINDLAY & Co., 54, Parliament Street, S. W.
T. FISHER UNWIN, 1, Adelphi Terrace, London, W.C.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
DEIGHTON BELL & Co., Cambridge.
W. THACKER & Co., 2, Creed Lane, London, E. C.
LUZAC & Co., 46, Great Russell Street, London, W. C.

ON THE CONTINENT:

R. FRIEDLANDER & SOHN, 11, Carlstrasse, Berlin, Germany.
OTTO HARRASSOWITZ, Leipzig, Germany.
KARL W. HIERSEMANN, Leipzig, Germany.
ERNEST LEROUX, 28, Rue Bonaparte, Paris, France.
MARTINUS NIJHOFF, The Hague, Holland.

[The maximum limit of the body of the Report is 12 pages.]

TABLE OF CONTENTS.

REPORT ON THE OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA, FOR THE YEAR ENDING THE 30TH JUNE 1911.

CHAPTER I.—ADMINISTRATION.

PARA.		PAGE
1.	Personal	1
2.	Tours	*ib.*
3.	Staff	*ib.*

CHAPTER II.—AGRICULTURAL EDUCATION.

4.	Agricultural Education	1

CHAPTER III.—AGRICULTURAL RESEARCH AND EXPERIMENT.

5.	The Deputy Director, Northern Circle	2
6.	The Deputy Director, Southern Circle	*ib.*
7.	Agricultural Stations	*ib.*
8.	Experimental Gardens	*ib.*
9.	Financial aspect	3
10.	Experiments through district agency	*ib.*
11.	Wheat	*ib.*
12.	Groundnut	*ib.*
13.	Cotton	4
14.	Tobacco	*ib.*
15.	Tea and Coffee	*ib.*
16.	Miscellaneous	*ib.*
17.	Chemistry	*ib.*
18.	Botany	5
19.	Entomology	*ib.*
20.	Sericulture	*ib.*
21.	Mycology	6

CHAPTER IV.—DEMONSTRATION, ETC.

22.	Demonstration	6
23.	Aid to the public	*ib.*
24.	Shows	*ib.*
25.	General progress	*ib.*

CHAPTER V.—AGRICULTURAL ENGINEERING.

Nil.

CHAPTER VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

26.	Publications	7
27.	Supply of information	*ib.*

CHAPTER VII.—MISCELLANEOUS.

28.	Poultry breeding	8
29.	Departmental Councils	*ib.*
30.	Conclusion	*ib.*

From S. G. GRANTHAM, Esq., I.C.S., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 64—5R.-50, dated the 3rd October 1911.

I am directed to submit five copies of proof in book form, of the Report on the operations of the Department of Agriculture, Burma, for the year ending 30th June 1911 with some minor corrections made in this office and to say that the Financial Commissioner has no remarks to make.

Printed by order of the Government of Burma.

G. B. C. P. O.—No. 1011, R. Secy., 9(½), 30-10-1911—474—J. A. P.

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA,

For the year ending the 30th June 1911.

CHAPTER I.

ADMINISTRATION.

Personal.

1. Mr. J. MacKenna, I.C.S, Director of Agriculture, was in charge of the Department from the commencement of the year to the 5th April 1911 when he proceeded on ten months' leave.

I was placed on special duty in the Director's Office from the forenoon of the 8th March 1911 and relieved Mr. MacKenna on the 5th April, thereafter remaining in charge of the Department until the end of the year.

Tours.

2. During the year 190 days were spent on tour, 135 days by Mr. MacKenna and 55 by myself. The following districts were visited:—Kyauksè, Prome, Rangoon, Yamèthin, Toungoo, Pegu, Lower Chindwin, Amherst, Sagaing, Katha, Bhamo, Pyapôn, Meiktila and Tharrawaddy.

Staff.

3. For the greater part of the year only two European agricultural experts, Mr. E. Thompstone, Deputy Director and Mr. F. J. Warth, Agricultural Chemist, were attached to the Department. Mr. A. McKerral returned to Burma at the close of May 1911, and the Province has since then been divided into two circles. The Southern Circle comprising the whole of Lower Burma and the Magwe and Meiktila Divisions of Upper Burma is under the charge of Mr. McKerral, the remainder being allotted to Mr. Thompstone who continues, as heretofore, to take charge of the Mandalay Experimental Farm.

This increase of staff has given considerable relief, but the work of the Department is already sufficient to occupy all the energies of the experts.

The Subordinate staff remains the same as that appointed last year.

CHAPTER II.

AGRICULTURAL EDUCATION.

Agricultural Education.

4. Little has been done with regard to agricultural education during the past year. A course of lectures and practical work in Agriculture, Chemistry, Botany and Entomology was given from June 7th to December 7th, 1910, to 2 Karen students from Nyaunglebin and 5 subordinates of the Department. The Director of Agriculture has been made a member of the Vernacular Text-Book Revision Committee.

A book on school gardening has been prepared by Mr. Thompstone, Deputy Director, for the Education Department and it is hoped that this will shortly be published both in English and in Burmese.

As regards the agricultural education of the adult portion of the population, it is recognised that from the Co-operative Credit Societies now springing up

the Department will receive very valuable assistance and a scheme has therefore been prepared and sent up for the creation of a staff of district vernacular agriculturists, recruited mainly from the Settlement and Land Records Departments to serve as intermediaries between this Department and these organisations, as well as the public generally.

CHAPTER III.

AGRICULTURAL RESEARCH AND EXPERIMENT.

The Deputy Director, Northern Circle (Mr. Thompstone).

5. For the greater part of the year Mr. Thompstone was the only Deputy Director attached to the Department. The whole of his time was divided between the Agricultural Stations of Mandalay and Hmawbi, the classes held in agriculture and allied subjects, correspondence (mostly consisting of the writing of notes and advice in response to requests for information) and such touring as was practicable.

Under the circumstances very little time was available for research work. Both the Assistant Botanist and the Entomological Assistant worked under Mr. Thompstone's charge throughout the year.

The Deputy Director, Southern Circle (Mr. McKerral).

6. Mr. McKerral, the Deputy Director, Southern Circle, only returned to Burma at the end of May. His work for the Department was thus limited to one month, but time was found to arrange for the coming season's work on the Hmawbi farm and for a short tour in the Thayetmyo District.

Agricultural stations.

7. The Administration Report of the Mandalay Station is printed as an Appendix to this report.

The Hmawbi station is still in its infancy. Sixty-four half-acre plots have been laid out which will during the coming season be cropped uniformly with one variety of paddy in order to ascertain the initial differences in fertility between them. It is proposed to extend this work gradually until 120 acres are available for experimental cultivation.

The development of the Hmawbi farm as an experimental station for Lower Burma paddies and also as a seed distributing centre is most urgently required. But it is as yet without buildings or equipment and, unless these can be provided it would, in my opinion, be desirable to postpone operations on any scale there for the present, as no useful results would be obtainable.

Experimental Gardens.

8. Experimental gardens are maintained at Sinlumkaba in the Bhamo District, Myitkyina, Falam, Tiddim and Haka in the Chin Hills, and Taunggyi in the Southern Shan States.

Sinlumkaba, Bhamo District.

In Sinlumkaba the heavy rainfall of the year which totalled 223 inches proved detrimental to the culture of vegetables and cereals. It appears to be doubtful moreover whether, even if climatic conditions were more favourable, the Kachin could be persuaded to take up wheat cultivation in preference to that of paddy. The most successful phase of the garden has been the instruction given therein to the boys of the Government Model School. The boys now grow vegetables of their own of a quality as good as those in the garden and sufficient in quantity to supply them with curry throughout the year.

The thanks of the Department are again due to Mr. D. W. Rae, for his enthusiasm and interest in the garden despite the adverse conditions of the year.

Taunggyi, Southern Shan States.

At the Taunggyi garden, tobacco, potatoes and coffee did well, but the demand for tobacco is small. 450 viss of potatoes were sent to Thazi for sale as an experiment, and fetched Rs. 10 a viss which just covered the cost of transport. Fruit trees were

supplied to Maymyo and the Chin Hills and a number were sold locally. Insect pests did less damage than in the previous year, but the yield of fruit continues disappointingly small. It was hoped that one of the Agricultural experts would have been able to arrange to visit the garden during the year, but the pressure of work due to the reduction of the staff rendered this impossible.

Myitkyina.

The garden at Myitkyina again did well, but the time would appear to be at hand when it can be dispensed with. It is noticeable that receipts fell off through the competition of Indian gardeners, which would indicate that if it were closed there are plenty of other agencies to supply its place.

Chin Hills.

In the Chin Hills vegetables did well except at Tiddim where the seedlings were washed away by heavy rain. The experiments in tea ended in failure and the fruit either from the unsuitability of the climate or a lack of knowledge of arboriculture on the part of the gardeners was also poor as a rule. In Falam however the plum trees did well. The gardens are probably without effect on the general cultivation of the Hills.

Financial aspect.

9. The total expenditure under all heads in the upkeep of the gardens was Rs. 7,066 and Rs. 1,597 was realised from sales of produce. The net cost to Government was therefore Rs. 5,469, or Rs. 987 less than last year.

Experiments through District Agency.

10. The cultivation of the Moulmein paddy imported by Government into the Akyab District continued. 713 acres are reported to have been sown, and large quantities of grain to have been disposed of to European Millers and Native Merchants at higher rates than in 1909-10. In some cases better prices were received by the cultivators than for the Necranzie variety. 5,300 baskets of seed are reported to have been retained as against 1,800 only in 1909-10. It is to be hoped that the new variety is now successfully established.

Wheat.

11. Experimental cultivation of wheat was continued in several districts. In the case of Mogôk a prolonged breach on the railway prevented the arrival of the seed grain in time for use. The experiments in Bhamo were more successful. The object here is to see whether each Military Police post could not be rationed by wheat locally grown.

A grant of Rs. 950 was sanctioned to meet the cost of the year's experiments and Mr. MacKenna who visited Bhamo in March recorded his opinion that the wheat we saw there was the best he had seen in Burma. The thanks of the Department are due to Major Orman for the interest he has taken in the matter, but it is to be regretted that owing to his absence on leave no formal report on the year's operations has been received.

In the Chin Hills the unusually heavy rainfall in March and the absence of rain in December had a very deleterious effect upon the crop, the estimated outturn being only half that of the preceding year.

Experiments in wheat cultivation will be undertaken during the coming season in the Mohnyin valley of the Katha District as the local Co-operative Credit Societies are interesting themselves in the matter, it is hoped that the experiments will be attended with success.

Groundnut.

12. The area under groundnut again declined, the figures being 102,566 acres as against 140,717* acres in 1909-10. A large part of this decrease is however attributed by the Commissioner of Settlements and Land Records to the revision in the Pakôkku estimate. Only one district, Sandoway, indented for groundnuts during the year. The crop however may be regarded as an established one.

* Revised figure.

Cotton.

13. The extensive experiments at the Mandalay farm reported last year have been continued. No seeds were indented for and none have been distributed pending a decision as to the best varieties for cultivation in this Province. During the year a bulletin on the cultivation of tree cottons was published, in which it was pointed out that the possibility of successfully cultivating these cottons on a commercial basis in Burma has not yet been satisfactorily established.

Tobacco.

14. The experiments in Havana and Virginia tobacco were much hampered by the late receipt of the seeds from America. This difficulty has been met in the present year by the transfer of the Department's custom to another firm.

Of the districts that did experiment in the year under report Kyauksè reported failure owing to lack of rain, and Upper Chindwin the same owing to faulty methods of cultivation. Both varieties were successful in Myitkyina.

Java tobacco was tried in Pakôkku with great success. 10 lbs. were supplied and the outturn is reported to have been 12,000 lbs. valued at Rs. 80 to Rs. 100 the 100 viss.

Tea and Coffee.

15. 80 lbs. of Palaung tea seeds were distributed to seven districts. Complete failure is reported from Toungoo and Ruby Mines and other districts have not yet communicated the result of the experiment.

85 lbs. Arabian and 38½ lbs. of Liberian Coffee were also distributed, but except in Bhamo without any satisfactory result. This solitary success may probably be attributed to the interest taken by Mr. Rae in this as in all experimental cultivation.

I cannot help thinking that the present method of distributing seeds to likely districts without waiting for requests for their supply is thoroughly unsatisfactory. I should prefer to send our lists of the seeds available for distribution on which the Department would be prepared to stock each year and to say that any application for the same either from individual cultivators or bodies of cultivators such as Co-operative Societies, whether sent direct or through the Deputy Commissioner would be met.

It would be easy to withhold further supplies from any applicant whose reports showed a lack of interest and both District Officers and this Department would be saved the unnecessary expenditure of a good deal of time and trouble. There would be at least an end of such reports as that the seed was mislaid by the district overseer.

Miscellaneous.

16. The cultivation of imported Soy beans on a specially selected plot near Amarapura has not been attended by success. The soil was supposed to be excellent for peas and beans but there was a marked decrease in oil content and the outturns do not by any means represent paying crops.

Jute seeds were distributed in several districts and the results will be recorded in next year's report.

The bone-meal manurial experiments on Mr. D'Castro's land mentioned last year are being continued and a series of instructions has been drawn up for their conduct. The results of the treatment cannot be fully ascertained till the third year but so far the experiment promises well.

Thirty-one tins of English vegetables seeds were distributed during the year. The results call for no comment. It is unlikely that the distribution is having any effect in the direction of introducing English vegetables into the general cultivation of the Province.

Chemistry.

17. Mr. F. J. Warth, M.Sc., Agricultural Chemist, was again in charge of the Chemical Laboratory throughout the year.

The following analyses were completed:—

Soil analyses	43
Sugar-cane analyses	7
Oil seeds analyses	12
Manure analyses	7
Fodder analyses	5
Silt work including silt determinations	445
Water analyses	148
Silt analyses	50
Miscellaneous	8
Total ...	725

This is an increase on last year's figures of 115, not including a number of humus determinations and soil extracts which have been made.

There are also a number of paddy analyses in progress which are still incomplete.

During the year full reports have been submitted on the Typical Soils of the Meiktila District, and on the Source Supply and Agricultural value of Silt in Burma. The preparation of this last report involved the expenditure of much time and labour. It has successfully established the parts of the Province where erosion is most rapid and also those where disintegration and therefore soil formation is most slow.

A second report on Sugar Cane is in course of preparation.

The enquiries at present in hand include a chemical study of the chief Taungya Soils, a detailed study of the Taungya soil at Pyintha in the Maymyo Subdivision of the Mandalay District and an examination of the typical paddy soils of Burma. For the last named enquiry the following experiments are now being conducted:—

(1) Examination of some of the paddy crops at the Mandalay station.
(2) Pot experiments.
(3) Field experiments.
(4) A study of paddy irrigation.

In connection with various enquiries Mr. Warth visited the Shwebo, Ruby Mines, and Katha Districts and also Rangoon. He also with the approval of the Local Government conducted the Diploma examinations at the Madras Agricultural College, Coimbatore. Mr. Warth as last year reports favourably on the work of Mr. Darabsett, B.Sc., and his other assistants.

Botany.

18. Mr. Sawyer, Assistant Botanist, was again fully occupied throughout the year. The greater part of the work on the survey of wheats and also on that of peas and beans has been completed. It is hoped that the latter may be finished by the beginning of next rains. The study of the oils of Burma mentioned last year was delayed owing to the pressure of other work demanding immediate attention, but it is hoped to resume it in the coming dry weather. As in former years the advice of the Assistant Botanist was asked on many subjects.

The Survey of Upper Burma paddies was completed during the year and published as "Occasional Paper" No. 1 of 1911.

Entomology.

19. The Entomological Assistant, Mr. Shroff, continued his enquiries into insect pests on cotton and other crops, and the best remedial processes to be adopted against them. Several leaflets were published and many enquiries received from District Officers and the general public were answered.

Sericulture.

20. Mr. Shroff was on deputation from the end of December 1910 to the middle of May to attend a course of Sericulture and ericulture at Pusa. He also visited several of the silk producing centres in Eastern Bengal before his return. He has submitted a very interesting report containing a scheme of work for Burma. This together

with Mr. Sawyer's report on the silk industry in the Karen Hills is still under consideration. Lack of staff and funds will prevent the carrying out of any comprehensive scheme but it is hoped that something may be done in the coming year to develop this industry.

Mycology.

21. In mycology little or nothing has been done. The study of blight and the plant diseases affecting the crops of the Province and the discovery of the necessary remedial measures are nevertheless of great importance, and attention has been directed to this question in recent Settlement reports. The present staff is however inadequate to deal with the matter efficiently. A solution of the difficulty may perhaps be found in the selection of a Botanist with mycological qualifications to fill the post of the Agricultural Botanist who is to be appointed when funds permit. The deputation of such an officer for a short period of two years, if it were practicable, would enable a much needed start to be made with these investigations.

CHAPTER IV.

DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

Demonstration.

22. No demonstration work has hitherto been undertaken owing to lack of staff. The scheme already mentioned for the creation of District Agriculturists is intended to remedy this omission. There is no doubt that properly supervised demonstrations would be eagerly welcomed in many places, particularly by the members of Co-operative Credit Societies which institutions are evincing great interest in Agricultural progress.

Aid to the Public.

23. Advice by the public has been freely sought throughout the year and was freely given. Seeds have been supplied to many persons, either free or on payment according to circumstances, and a scheme for the supply of improved agricultural implements to cultivators prepared by this Department has received the sanction of the Local Government.

Shows.

24. The Bhamo Agricultural and Live Stock Show held on 27th and 28th March was a great success. The cattle exhibits were numerous and of first class quality. The vegetables shown were excellent and very good exhibits of wheat were sent by the Military Police and the Kachin School at Sinlumkaba. The potatoes were also noticeably good and it is a pity that a trade in them cannot be created.

A grant of Rs. 600 was made to the Agri-Horticultural Show at Rangoon in January. The exhibits sent by the Department attracted much attention.

General Progress.

25. The general progress made during the year is most encouraging. The appointment of the Director as Joint-Registrar of Co-operative Credit Societies has borne fruit in the creation of much closer relations between the two Departments than have hitherto existed, and consequently also between the Department and the cultivators. If the independent initiative of the people is to be encouraged it is important that the principle should be observed that self-help is a condition precedent of State aid in the development of agriculture, and the more intimate the connection of this Department with the Co-operative movement the more closely will it be to the realisation of that ideal. The Agricultural and Co-operative Conference held at Mandalay in July after the close of the year still further emphasized this connection. The presence of the Lieutenant-Governor in the Chair at both general meetings of the Conference and the attendance of many high officials and of the

Chairman and several representatives of the Burma Chamber of Commerce at its meetings have given a great impulse to the work of the Department. It is a matter for much regret that Mr. MacKenna who has presided over the Department since its independent existence began and is responsible for so much of its present achievement should have been prevented by his absence on leave from representing the Department at the Conference.

CHAPTER V.

AGRICULTURAL ENGINEERING.

Nil.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Publications.

26. During the year the following cultivators' leaflets were issued :—

No.	Subject.	Author.	Languages.
1	2	3	4
24	The Rice Hispa	Mr. K. D. Shroff, B.A. ...	English and Burmese.
25	The Swarming paddy Caterpillar.	Do. ...	Do.
26	The Mandalay Agricultural Station.	Mr. J. MacKenna, I.C.S. ...	Do.
27	The Lemon Butterfly ...	Mr. K. D. Shroff, B.A. ...	Do.

The following publications were also completed during the year:

AGRICULTURAL SURVEYS.

The Agricultural Survey of the Sagaing District.

BULLETINS.

No. 3.—Papers on the Manufacture of Jaggery from the Juice of the Toddy Palm with special reference to the effects of the industry on the timber supply of the dry zone of Burma.

No. 4.—The Rhinoceros Beetle and its ravages in Burma.

No. 5.—Notes on Tree Cotton Cultivation in Burma.

MISCELLANEOUS.

Occasional papers No. 1.—A preliminary note on the classification of Paddies grown in Upper Burma.

Supply of information.

27. Numerous questions on agricultural matters have been received from Government Officials and from the public and have been carefully answered. Those relating to the cultivation of para rubber and castor-oil have been especially frequent. A bulletin on the former and a leaflet on the latter are about to issue.

CHAPTER VII.

MISCELLANEOUS.

Poultry breeding.

28. Poultry breeding has been undertaken at the Mandalay Agricultural station with a fair measure of success, and some of the stock is now available for sale to the general public.

Departmental Councils.

29. Opportunity has been taken for meetings of the Departmental Council of the Department at intervals throughout the year, and the discussions at these meetings do much to help the co-ordination of work among the various experts and it is proposed to hold them, if possible, more frequently in future.

Conclusion.

30. The staff has worked excellently throughout the year and I have again to express my thanks for the cordial assistance given to the Department on all occasions both by District Officers and by the general public. In particular the keen interest taken by the Burma Chamber of Commerce in the efforts of the Department to improve the agriculture of the Province deserves special recognition at my hands.

H. CLAYTON, M.A., I.C.S.,

Officiating Director of Agriculture, Burma.

MANDALAY, 31*st August* 1911.

APPENDICES.

PAGE

APPENDIX I.—Statement of receipts and expenditure for experimental cultivation during 1910-11. 11

APPENDIX II.—Administration Report of the Agricultural Station, Mandalay, for 1910-11 12

APPENDIX I.

Receipts and Expenditure for experimental cultivation during the year 1910-11, *exclusive of the Agricultural Station, Mandalay.*

No.	Stations.	Budget allotment.	Receipts from the sale of produce.	Expenditure.							Total.
				Establishment.	Wages of farm ma:stries and coolies.	Feed and upkeep of stock.	Purchase of seed and fruit trees.	Upkeep of gardens, fencing, and trenching.	Purchase of live stock and agricultural implements	Miscellaneous contingencies.	
1	2	3	4	5	6	7	8	9	10	11	12
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Bhamo (Sinlumkaba).	1,250	170	900	...	...	34	57	...	1	992
2	Chin Hills (Falam)	1,558	237	1,008	...	...	169	...	...	79	1,256
3	Myitkyina ...	1,618	182	918	...	...	12	265	33	3	1,231
4	Southern Shan States (Taunggyi).	5,335	1,008	2,963	...	62	2	257	206	97	3,587
5	Distribution of seeds from headquarters.	3,000	...	...	...	...	2,388	...	...	..	2,388
6	Distribution of agricultural implements.	2,000	...	...	...	...	...	...	...	...	...
7	Sericulture ...	500	...	...	...	...	...	...	...	...	...
	Total ...	15,261	1,597	5,789	...	62	2,605	579	239	180	9,454

APPENDIX II.

ADMINISTRATION REPORT OF THE MANDALAY AGRICULTURAL STATION FOR THE YEAR 1910-11.

1. *General.*—The whole area amounting to about 430 acres has now been cleared of jungle. Of this area about 7 acres are occupied by buildings, compounds, and stoned roads, 2½ acres by the poultry department and 50 acres are under pasture. The remainder except for Farm roads and mud roads between the plots, is under cultivation. Many permanent improvements have been carried out and the Farm is gradually being brought into good working order. The results of Experiments so far obtained are detailed in the Scientific Report. Many new experiments have been started during the year, and a number of working cattle have been purchased. We have 62 head of cattle and 4 buffaloes on the Farm and it is proposed to raise the stock to 40 pairs of cattle during the present year. The crops have been on the whole satisfactory and the outturn of the produce has increased.

2. *Staff.*—The Farm has been entirely under my control, with the assistance of the Superintendent, Maung Aung Dun, one overseer and five sub-ove seers. One sub-overseer, Maung Ba (I), was posted to Hmawbi on the 1st January 1911. Two probationers, Maung Tin and Mr. D'Castro have been entertained, with effect from the 16th August 1910 and 9th June 1911, respectively, and are being trained in the work. Other minor changes took place during the year. Maung San Thein was employed as a probationer for a short time, but was asked to resign owing to his unsuitability for the post. Maung Ba Tin, also acted as Sub-overseer for Maung Ba (II), transferred, from 1st April to 13th April 1911, but was found to be unsuitable for the work.

Houses.—The work is very greatly handicapped by a lack of living accommodation both for the staff and the coolies. Though the Farm was opened in 1907 no quarters of any description have yet been provided, and as it is essential that the Superintendent and the Staff live on the Farm they are forced to live in squalid huts totally unfit for men of their position. Some of them who cannot afford to build huts are even worse off, occupying only corners of the huts belonging to others. The situation is very awkward and rapidly becoming worse.

As regards cooly quarters it is very difficult to obtain reliable men without quarters for them to live in. It frequently happens that at the time when they are most urgently needed to do experimental work they stay away and others cannot be obtained. The result is that some of the experimental work is ruined for want of labour at the proper time and our bullocks often have to remain idle for want of bullock men.

Water-supply.—The Farm tube well has now been down more than three years and we have still no proper water-supply. At present the drinking water has to be carted by bullocks, which is very expensive; and the cost of pumping owing to the lack of a suitable tank is very greatly increased. The work has been in the hands of the Public Works Department since the well was put in but very little progress is being made. We are greatly handicapped, and put to a great deal of expense owing to the lack of a proper supply.

3. *Labour.*—The cost of labour has been heavy partly owing to the many permanent improvements, such as drains, roads and clearing the jungle, which are being carried out during the year but as very little more of this kind of work remains to be done, it is hoped that the expenditure under this head may be reduced in future. As previously, coolie labour has been supplied from the Farm when required by the Agricultural Chemist, Assistant Botanist and Entomological Assistant, no charges being made on these officers. This adds to the expenditure under wages for Farm maistries and coolies. The wages of the *Malis* employed round the office and roads also have to be debited to the same head, as there is no grant for maintenance and upkeep of these places.

4. *Cattle.*—There are 31 pairs of bullocks valued at Rs. 4,340 and 2 pairs of buffaloes valued at Rs. 250. One buffalo was bought for Rs. 60 to replace the one which died during the previous year. With the exception of the slight attack of foot-and-mouth disease, the cattle have been healthy and are looking well. A better supply of good water has been obtained from the artesian well since December 1910. An "Izal" tank to guard against future attacks of foot-and-mouth disease has been constructed.

5. *Fodder.*—The cattle have been well provided with fodder grown on the Farm although there was not sufficient *pyaung* to suffice for the whole year; we had a surplus of paddy straw for sale. Sessamum cake and bran have been bought for feeding purposes as before.

6. *Manures.*—A quantity of stable manure has again been procured from the Mandalay Municipality and home made cattle manure has increased in quantity, though owing to the state of the manure tanks it cannot be properly stored. The value of the artificial manure purchased during the year amounts to Nitrolime Rs. 307-8-0 and Nitre Rs. 135; total Rs. 442-8-0.

Manure tank.—The manure pits made by the Public Works Department in 1908, have never been used owing to their unsuitability for the purpose for which they are required. They are not water-tight and are consequently filled with water which largely enters through the wall from the soil. Moreover, the walls not being strong enough are now almost completely broken down. It is proposed that the material of which these tanks are made shall be taken out and used to build a shallower and smaller tank which can more easily be made water-tight. It is absolutely essential that provision be made for the proper storage of manure.

7. *Implements and Machinery.*—It has been necessary to spend a considerable sum of money on implements. This necessity has arisen because we have no funds for the distribution of the Agricultural implements to cultivators. The scheme now proposed for implement distribution should relieve the Farm of a good deal of this expense in future. A good number of implements were distributed and orders were received for many more for distribution during the present year. Several implements, specially the "Beeloo" plough, Reaping Machine, Set-ton, Weeding harrow, Angle-harrow, and small weeding implements have found favour in the eyes of the cultivators (*vide* Scientific Report).

8. *Seeds and Produce.*—During the year the sum of Rs. 4,416-11-10 has been credited into the treasury for sale proceeds of the Farm produce. The value of seeds distributed gratis or by book transfer or through the Director of Agriculture, up to the 30th June amount to a total of Rs. 130-8-0. The value of seeds, etc., on hand amounts to a total of Rs. 1,156-8-0.

9. *Roads, etc.*—The making of Farm roads and the digging of drains have been continued as before. A good outlet has been obtained for the Farm carts from the Farm building to Shanzu Road by the completion of the metal road and the bridge over the distributary. The fence around the Farm has again broken down in several places owing to improper construction and the poor straining bolts.

Accounts.—The attached statement shows the receipts and expenditure for the year.

Statement showing Receipts of the Agricultural Station, Mandalay, for the year ending the 30th June 1911.

—	Amount.			Total.		
1	2			3		
	Rs.	A.	P.	Rs.	A.	P.
Sale of Farm Produce.						
Paddy	3,370	0	2			
Gram	274	1	11			
Groundnuts	46	9	2			
Pe-di-sein	2	8	0			
Pe-sein-gon	26	9	6			
Vegetables	44	3	4			
Mat-pe	9	0	0			
Paddy straw	180	8	0			
Cotton	17	9	0			
Linseed	3	0	0	3,974	1	1
Value of Implements distributed :—						
Sale of implements	18	0	0			
Implements distributed free	30	0	0			
Implements Book transfer through Director of Agriculture ...	172	0	0	229	0	0
Value of seed distributed :—						
Seeds distributed free	102	4	0			
Seeds Book transfer through the Director of Agriculture ...	28	4	0	130	8	0
Hire of winnowing machine	33	0	0			
Hire of reaping machine	15	10	9			
Hire of Farm Carts	34	8	0	83	2	9
	.....			4,416	11	10
Value of produce on hand :—						
Paddy	475	8	0			
Wheat	258	0	0			
Gram	95	0	0			
Groundnuts	12	0	0			
Mat-pe	11	0	0			
Paddy straw	100	0	0			
Cotton	10	0	0			
Linseed	55	0	0			
Sunn Hemp	75	0	0			
Miscellaneous	65	0	0	1,156	8	0
Total ..	.....			5,573	3	10

Statement showing Expenditure of the Agricultural Station, Mandalay, for the year ending the 30th June 1911.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SUPPLIES AND SERVICES.		
* Wages for Farm maistries and coolies	8,133 12 9	
Feed and upkeep of stock	889 9 2	
Purchase of seeds and fruit-trees	450 7 9	
Upkeep of garden, fencing and trenching	1,928 6 7	
Purchase of live-stock and agricultural implements	3,457 4 2	
Petty construction and repairs of work	871 6 8	
		15,730 15 1
Contingencies :—		
Service postage and telegram charges	21 7 0	
Purchase of furniture	65 0 0	
Freight, shipping, and landing charges	933 1 3	
Purchase of books and periodicals, etc.	.....	
Office expenses and miscellaneous	720 10 4	
		1,740 2 7
		17,471 1 8
* Includes labour expended for Agricultural Chemist	66 14 6	
Do. Entomological Assistant ...	230 13 9	
Do. Assistant Botanist	150 6 9	
Total ...	.....	17,022 14 8

E. THOMPSTONE,
Deputy Director of Agriculture, Northern Circle.

MANDALAY, *6th August* 1911.

G. B. C. P. O.—No 38, D. of A. 15 (*f*), 30-10-1911—454—R. E. R.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ended the 30th June 1912

RANGOON

OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, BURMA

1912

LIST OF AGENTS

FOR THE

SALE OF GOVERNMENT PUBLICATIONS.

IN INDIA:

THACKER, SPINK & Co., Calcutta and Simla.
W. NEWMAN & Co., Calcutta.
THACKER & Co., Bombay.
HIGGINBOTHAM & Co., Madras.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
* D. B. TARAPOREVALA & SONS & Co., 103, Meadow Street, Fort Bombay.
BUTTERWORTH & Co. (INDIA), LTD., 8-2, Hastings Street, Calcutta.

IN ENGLAND:

HENRY S. King & Co., 65, Cornhill, E.C., London.
CONSTABLE & Co., 10, Orange Street, Leicester Square, W.C.
KEGAN PAUL, TRENCH, TRUBNER & Co., 68—74, Carter Lane, E. C.
BERNARD QUARITCH, 11, Grafton Street, New Bond Street, W.
P. S. KING & SON, 2 & 4, Great Smith Street, Westminster, London, W. S.
GRINDLAY & Co., 54, Parliament Street, S. W.
T. FISHER UNWIN, 1, Adelphi Terrace, London, W.C.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
DEIGHTON BELL & Co., Cambridge.
W. THACKER & Co., 2, Creed Lane, London, E. C.
LUZAC & Co., 46, Great Russell Street, London, W. C.

ON THE CONTINENT:

R. FRIEDLANDER & SOHN, 11, Carlstrasse, Berlin, Germany.
OTTO HARRASSONITZ, Leipzig, Germany.
KARL W. HIERSEMANN, Leipzig, Germany.
ERNEST LEROUX, 28, Rue Bonaparte, Paris, France.
MARTINUS NIJHOFF, The Hague, Holland.

---

* For the sale of official publications excluding those of the Legislative Department of the Government of Burma.

[The maximum limit of the body of the Report is 12 pages.]

TABLE OF CONTENTS.

REPORT ON THE OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA, FOR THE YEAR ENDED THE 30TH JUNE 1912.

CHAPTER I.—ADMINISTRATION.

PARA.		PAGE
1.	Personal	1
2.	Tours	*ib.*
3.	Staff	*ib.*

CHAPTER II.—AGRICULTURAL EDUCATION.

4. 5. 6.	Agricultural Education	1—2
7.	School Gardens	2

CHAPTER III.—AGRICULTURAL RESEARCH AND EXPERIMENT.

8.	The Deputy Director, Northern Circle	2
9.	The Deputy Director, Southern Circle	3
10.	Agricultural Stations	3—4
11.	Experimental Gardens	4
12.	Sinlumkaba, Bhamo District	*ib.*
13.	Taunggyi, Southern Shan States	*ib.*
14.	Myitkyina	4—5
15.	Chin Hills	5
16.	Financial aspect	*ib.*
17.	Experiments through District agency (Moulmein paddy in Akyab)	*ib.*
18.	Wheat	*ib.*
19.	Groundnut	6
20.	Cotton	*ib.*
21.	Tobacco	*ib.*
22.	Rubber	*ib.*
23.	Miscellaneous	6—7
24.	Chemistry	7—8
25.	Botany	8
26.	Entomology	8—9
27.	Sericulture	9
28.	Mycology	*ib.*

CHAPTER IV.—DEMONSTRATION, ETC.

29.	Demonstration—Aid to the Public	9
30.	Shows	9 & 10
31.	General Progress	10

CHAPTER V.—AGRICULTURAL ENGINEERING.

Nil.

CHAPTER VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

32.	Publications	10
33.	Supply of Information	11

CHAPTER VII.—MISCELLANEOUS.

34.	Poultry breeding	11
35.	Departmental Conferences	*ib.*
36.	Conclusion	*ib.*

From S. G. GRANTHAM, Esq., I.C.S., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 244—5R.-85, dated the 8th October 1912.

I am directed to submit five copies of proof in book form of the Report on the Operations of the Department of Agriculture, Burma, for the year ending the 30th June 1912.

2. The Financial Commissioner remarks as follows:—

"The report is a record of much useful work accomplished. The Agricultural Department, particularly now that rice cultivation is being studied at Hmawbi, is certain to increase in usefulness yearly.

Nothing is said in the report about the so-called "poisonous beans." One of the tasks of the Agricultural Department is to divert the cultivators from the variety which is at least regarded by merchants as dangerous and to popularize another variety which has not the same defect."

3. The attention of the Director of Agriculture has been drawn to the latter fact.

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA,

For the year ended the 30th June 1912.

CHAPTER I.

ADMINISTRATION.

Personal.

1. Mr. H. Clayton, I.C.S., officiated as Director of Agriculture from the commencement of the year till the 10th April when I returned from leave and resumed charge of the Department.

Tours.

2. During the year 165 days were spent on tour—154 by Mr. Clayton and 11 by me. The following districts were visited:—Kyauksè, Meiktila, Yamèthin, Shwebo and Myitkyina in Upper Burma: and Toungoo, Pegu, Hanthawaddy (Syriam), Insein, Tharrawaddy, Amherst, Prome and Thatôn in Lower Burma.

Staff.

3. The superior and subordinate scientific staff remained unchanged throughout the year but, in consequence of increasing work, the clerical staff of the Deputy Director, Northern Circle, was strengthened by the addition of a second clerk and a store-keeper and preparer were added to the establishment of the Agricultural Chemist. Two temporary lecturers have also been appointed to conduct the classes for the training of District Agriculturists.

CHAPTER II.

AGRICULTURAL EDUCATION.

Agricultural Education.

4. In paragraph 4 of last year's Report Mr. Clayton referred to the agricultural education of the adult portion of the population. The scheme for the creation of a staff of district vernacular agriculturists has now been sanctioned as an experimental measure and six men have been selected from Settlement parties for training as District Agriculturists. On completion of their training they will be posted to the Shwebo, Yamèthin, Pakôkku, Pegu, Amherst and Henzada Districts, the whole cost of the scheme in Upper Burma being borne by Provincial Funds and, in Lower Burma, being shared between Provincial Funds and District Cess Funds.

5. With a view to selecting lecturers for the training of these District Agriculturists sanction was given to a proposal that the Deputy Director of Agriculture, Northern Circle, should deliver a course of lectures in Agriculture combined with practical work to a class of selected English-speaking Burmans, including some of the present staff on the Mandalay Farm. This course, which embraced Agriculture, Chemistry, Botany and Entomology, extended from September 1911 till April 1912, and was attended by sixteen students: five from the staff of the Department and eleven outsiders. From this class the two lecturers for the District Agriculturist class have been selected.

6. The training of the District Agriculturists began on the 1st of June and will extend over a period of nine months. Special emphasis is being laid on Practical Agriculture but the course also embraces the Theory of Agriculture, Chemistry and the Elements of Botany and Entomology. Lectures will also be given on the Principles of Co-operation and on the general duties of District Agriculturists. I rather regret that permission was given to the Deputy Director, Northern Circle, to enrol private students as well and that a class of about twenty has been formed. As the scheme is purely experimental and its being made permanent will depend on the amount of success achieved by the first batch, it would perhaps have been better to have kept the District Agriculturist course entirely separate and distinct. In future I shall certainly do so. It is true there is a certain demand for Agricultural Education and we get a few sons of *bonâ fide* cultivators who come with the definite intention of returning to the land and without any ulterior motive. For such a practical training can always be arranged, either at Mandalay or Hmawbi. But the remainder, though protesting strongly to the contrary, come either in the hope of an appointment or with a view to getting a certificate which may, or may not, help them to obtain other situations. Until the Department is fully organised and there is a prospect of a steady flow of appointments I do not propose to encourage this promiscuous enrolment but to limit courses strictly to the object in view.

School Gardens.

7. The book on School Gardening prepared by Mr. Thompstone, Deputy Director, will be issued about the end of the year.

Under the scheme for the development of Technical Education—School Gardening and Nature Study have been approved for the large Christian Karen community which has its ecclesiastical headquarters at Shwegyin and Nyaunglebin. A non-recurring grant of Rs. 5,000 was given by the Local Government to the Revd. E. N. Harris for equipment at Shwegyin and Nyaunglebin and this amount has been judiciously expended. School gardens have been started at both places and instruction in Agriculture and Nature Study is given by two Karens who were trained at Mandalay. The Department gives what assistance it can to this movement. From this small beginning Mr. Harris hopes to elaborate a system of agricultural development which will embrace the whole Karen community in his charge and I am pleased to say that the Karen National Association have volunteered substantial financial assistance.

CHAPTER III.

AGRICULTURAL RESEARCH AND EXPERIMENT.

The Deputy Director, Northern Circle (Mr. Thompstone).

8. The return of Mr. McKerral and the consequent partition of the Province into two Agricultural Circles of Superintendence has allowed of Mr. Thompstone devoting more time to district work and, to some extent, to research work. Much time was, however, spent on teaching, and this, combined with the fact that the subordinate scientific staff is stationed at Mandalay and that their work must be overlooked by Mr. Thompstone renders it improbable that he will, at least for some time to come, be able to take up the continuous work of an Agricultural Survey.

The oversight of the Mandalay Agricultural Station formed the principal part of Mr. Thompstone's work during the year under report. The work has been largely a continuation of that of previous years; but in some directions it has been discontinued as unsuitable whilst in others, as, for example, in seed selection and distribution, it has been largely extended. Small outside experiments were carried out at Thondaung in the Maymyo Subdivision on "taungyas" and at Ywathitgyi in the Katha District on wheat. The results will be separately referred to later in this Report.

The educational work done by Mr. Thompstone is referred to in Chapter II, He has collaborated during the year with the Assistant Botanist on surveys of

the peas and beans, and the wheat of the Province and a survey of the jowars is now in hand. Mr. Thompstone attended the Bhamo Agricultural and Live Stock Show held in March 1912 and took advantage of the opportunity to tour in the district in connection with wheat cultivation. He also made an extensive tour in the Southern Shan States and various minor tours in connection with local enquiries and demonstrations.

The Deputy Director, Southern Circle (Mr. McKerral).

9. *Mr. McKerral, Deputy Director, was in charge of the Southern Circle throughout the year. He attended the Agricultural and Co-operative Conference at Mandalay in July* and immediately afterwards, in the first week of August, commenced the Agricultural Survey of the Yamèthin District. He was engaged on this work and on the general supervision of the Hmawbi Agricultural Station till the middle of October. The Report on the Survey of the Yamèthin District is now in the Press.

In October Mr. McKerral's headquarters were fixed at Insein where he now has an office. An Agricultural Survey of the new Insein District was carried on simultaneously with the general supervision of work at Hmawbi and was completed early in April. This survey has given much interesting and useful information with regard to paddy cultivation and the distribution of varieties in Lower Burma and will be of much assistance in the organising of work at Hmawbi on correct lines. As the agricultural conditions over large tracts of Lower Burma are practically similar, I have decided not to publish Agricultural Surveys of particular districts but to await the completion of the surveys of a division or publish, in the separate monographs, information of value on particular points which come out in the course of these surveys. There would be a monotonous sameness about Lower Burma District Survey Reports and it will probably be better to collect and publish only general conclusions arrived at from the survey of a number of districts. At the request of the Inspector-General of Agriculture in India, Mr. McKerral attended the meetings of the Indian Board of Agriculture at Pusa in November, and in March, at the request of the Government of Madras, he acted as Examiner in the Diploma Examinations of the Agricultural College, Coimbatore.

In addition to the experimental work planned and begun at Hmawbi, a survey of the Sesamum varieties of Burma has been put in hand. For this purpose a small area of land amounting to about $1\frac{3}{4}$ acres has been rented at Tatkon in the Yamèthin District. On the same area, a plot of Cambodia Cotton, the seed of which was obtained from Madras, is under trial in the hope of its proving suitable for Burma. Its staple is much superior to that at present grown; and, as the Agricultural Survey of the district has revealed the fact that considerable areas of Yamèthin are suitable for cotton, it is hoped that it may be possible to establish the crop in that tract.

I have, however, to note with regret that these experiments are being conducted under great difficulties on account of the small amount of assistance rendered by the thugyi and villagers, although everything is paid for at very favourable rates. This simply illustrates the difficulties which have to be met when we try to work through local village agencies without having a trained subordinate permanently on the spot. The Deputy Director, Northern Circle, has had similar experiences, and it will be unfortunate if we can only conduct outside experiments under close personal supervision. It will involve either a considerable increase of subordinate staff or a curtailment of experiment.

Mr. McKerral also visited the Myedè Subdivision of the Thayetmyo District in connection with the expansion of "dhall" (*cajanus indicus*) cultivation; and the Zeyawaddi grant in the Toungoo District in connection with an enquiry into sugarcane. He also gave considerable attention to the School garden work of the American Baptist Mission at Nyaunglebin and Shwegyin.

Agricultural Stations.

10. Administration reports of the Mandalay and Hmawbi Agricultural Stations are printed as Appendices to this Report. At Mandalay a small shed for implements has been

erected during the year; and the subordinate staff, by means of house-building advances, have been able to erect residences for themselves on sites leased to them by the Director. The crying want is still the water-supply, but it is hoped that its installation will soon be effected.

A welcome non-recurring grant of a lakh of rupees from the Government of India will permit of some necessary additions to buildings at Mandalay and enable us to partially equip the Hmawbi Station. The full equipment of Hmawbi is a matter of first importance.

Experimental Gardens.

11. Experimental gardens (so called) are maintained at Sinlumkaba in the Bhamo District, Myitkyina, Falam and Tiddim in the Chin Hills and Taunggyi in the Southern Shan States.

Sinlumkaba, Bhamo District.

12. In my Report for 1909-10 it was noted that the definite objects of this garden were:—

(i) the cultivation of cereals superior in outturn and value to hill-paddy;

(ii) the arrangement and extension of the existing system of permanent terraced cultivation; and

(iii) the instruction of the pupils of the Government School in agriculture and horticulture.

Under the first head experiments were made with wheat and have been successful—an exhibit from the garden taking first prize at the Bhamo Agricultural Show. Nothing has been done under the second head while this year no classes for school boys were held but the gardener attended the School garden and gave them advice and instruction. Their garden was a great success and the outturn of vegetables from it very satisfactory.

As pointed out by the Deputy Commissioner the cultivation of wheat in this garden is hardly worth the while. The Kachins are rice-eaters, and, even if they grow wheat for the Military Police the heavy cost of transport would put it out of the market.

This being so, beyond adding to the amenities of officers stationed at or visiting Sinlumkaba, the garden has no practical utility. A school garden has, apparently, now been successfully established and this should suffice for the requirements of the place. I think that the garden should be closed, but the gardener might be retained at the expense of the Agricultural Department to supervise the school garden. The whole question of these gardens will, however, be gone into at the next Departmental Conference.

Taunggyi: Southern Shan States.

13. The future conduct of this garden is also under consideration. Mr. Thompstone made an extended tour in the States in the month of May and submitted proposals for the future conduct of experimental work in the States. While a number of successes have been achieved in the past it is pointed out that effort has been spasmodic and dependent on the amount of personal interest taken for the time being by the Superintendent and Political Officer in charge of the States. Mr. Thompstone considers that if any permanent results are to be obtained we must have a properly trained European gardener from one of the fruit-growing counties of England. The scheme is under consideration in consultation with the Superintendent and Political Officer, Southern Shan States, but it seems to me that money would be more advantageously expended on the development of the wheat industry of the States than on the production of peaches and strawberries. With the advent of the Railway the Agriculture of the States will assume a new importance, and a seed production and distribution farm in the centre of the wheat area seems to me to be the most important requirement. The production of European fruits is a matter of very secondary importance. There is really no demand for them which would make their production on a large scale profitable.

Myitkyina.

14. For the last year or two it has been indicated that the Myitkyina garden, on its old basis, was rapidly reaching its limit of utility. This is true so far as the cultivation of

exotic fruit trees and vegetables is concerned. It has now been decided to grow potatoes of selected kinds in the experimental garden for a year or two in order to provide market gardeners with good seed. At present potatoes of not very good quality are grown largely at Myitkyina and Indian gardeners make a good thing by exporting them. A scheme has therefore been drawn up for working the garden as a potato seed production station. The Deputy Director, Northern Circle, will be in charge of the work; though the supervision will remain in the hands of the local officers.

Chin Hills.

15. Government has ceased to give any assistance to the garden at Haka. It has been handed over to the Assistant Commandant of the Military Police Battalion to grow vegetables for his policemen and other residents in the station as he may arrange. At Tiddim only two residents avail themselves of the produce of the garden the receipts from sales of vegetables being Rs. 22. The Assistant Superintendent proposes to select a new site, but I do not think this should be sanctioned. At Falam Rs. 245 were realised from the sale of vegetables.

It is a great pity that the title "Experimental" has been applied to these gardens and that, on this basis, various fruit trees, etc., have from time to time been sent at the request of individual officers, which are always solemnly noted upon—generally as failures—in the Reports of the Stations. Even if they suceeeded, I do not see what good these fruit-trees would serve. The Chins do not want them and they could not be got out to Burma at a rate at which any one would buy them. The principal production of these gardens being vegetables it seems to me that an equally good supply would be forthcoming if Government were to confine itself to a free supply of seed and left the actual cultivation to be undertaken by private effort. The whole question of the future policy of Government with reference to these gardens will be gone into shortly.

Financial Aspect.

16. The total expenditure under all heads on the upkeep of the gardens was Rs. 6,937 and Rs. 1,388 were realised from sale of produce. The net cost to Government was therefore Rs. 5,549 or Rs. 80 more than last year.

Experiments through District Agency. (Moulmein paddy in Akyab.)

17. The area under Moulmein paddy, originally imported by Government, shows a healthy expansion, there being last year 3,988 acres planted. About 7,500 baskets have been kept for seed. It is also gratifying to find that some of the rice-milling firms, realising the superiority of the grain, are themselves importing seed which is distributed to cultivators through their brokers. I think the new variety may be considered to be firmly established.

Wheat.

18. A curious position of affairs has arisen with reference to the cultivation of wheat in the Chin Hills. There has been a great excess of production over the demand and consequently the Superintendent of the Chin Hills has been asked by the Police Department to stop the cultivation for a year. This is a most unfortunate state of affairs and it may be difficult to get supplies up to requirements again. But, in any case, it has been clearly established that wheat can be successfully grown in the Chin Hills and in sufficient quantities to ration all the local Military Police.

So little interest is taken by the higher police authorities in the cultivation of wheat by the Military Police in the Bhamo District that it has been abandoned. There is no reason why Bhamo Military Police should not have been able to ration themselves: but the "contract system" commends itself more to the Police authorities.*

Meanwhile experiments are being carried out with the aid of Co-operative Credit Societies in the Mohnyin-Mogaung Valley. These will be continued this year under the supervision of Mr. Thompstone.

*I am glad to say that since the above was written I have been informed that the Battalion Commandant has been directed to carry on the experimental cultivation again this year, if considered advisable, on a more extended scale and to employ the Military Police to do the work.

Groundnut.

19. The area under groundnut, is this year 142,316 acres as against 102,232* acres in 1910-11 and 140,717 acres in 1909-10. The crop is firmly established and the variations in area from year to year indicate that cultivators realise when it is advisable to sow this crop and when to substitute another. A good deal depends on the early rains; if these are good and a crop of early sesamum can be obtained it will be found that the area under groundnut will go down; if the early rains fail—the situation is saved by the groundnut crop.

The only district to which groundnut seed was supplied was Sandoway but the result of the experiment has not yet been reported. A modest request from Kyaukpyu for enough seed to sow 200 acres was refused as on a former occasion when a considerable amount of seed was sent no interest whatever was taken in the experiment. I am quite willing to procure seed for private individuals on payment and more interest will probably be taken in seed that costs money than in that which is given free.

Until we can afford to take up an area for experiment in a groundnut district I am afraid we can do nothing in the way of introducing new varieties or of improving the indigenous crop. The soil of the Mandalay Farm is absolutely unsuitable.

Cotton.

20. The record of cotton experiments at Mandalay is one of complete failure. None of the exotics tried have succeeded at all. The tree growth is good enough but the crop is light.

Cambodia cotton imported from Madras last year promises well and yielded, at Mandalay, about 180 lbs. of cleaned cotton to the acre but it is too soon to speak with confidence about it. A certain amount of seed has also been distributed to various districts and Mr. McKerral has, as formerly noted, laid down a small experimental area at Tatkon in the Yamèthin District.

Tobacco.

21. It is probably not generally known that the average export of unmanufactured tobacco from Burma for the last five years has been close on 60,000 cwt., the exports in 1911-12 being no less than 95,233 cwts. Over the last five years the average area under tobacco has been nearly 80,000 acres.

It has been the custom of this Department for many years to issue large quantities of Havana and Virginia tobacco seed to tobacco-growing districts and although, in many cases, partial or total failures have been reported I venture to suggest that in this as in other cases of seed distribution, less care even is taken in the collection of reports than in the issue of seed. My own experience and observation leads me to believe that this distribution of seed has had a marked effect on the tobacco supply of the country. The distribution will be continued but will be more systematised.

Rubber.

22. While the Forest Department is still supposed to be the Department of Government most interested in Rubber cultivation, the general public seem to consider that the Agricultural Department should deal with it and, consequently, we have very numerous enquiries about this: so much so that we have this year issued a Bulletin and a leaflet on Para rubber.

So far as Burma is concerned the planting of new estates goes on with vigour in districts as remote from each other as Mergui and Myitkyina. Some I am afraid are doomed to failure but it is impossible to check the optimism of the experimenters.

There has been some disappointment with the germination of seed obtained from Ceylon and I would recommend the use of seed or, preferably, "stumps" obtained from the older Burma estates.

Miscellaneous.

23. Lucerne was tried at Maymyo and in the Southern Shan States with qualified success. The crop is a difficult one to manage and, except under very careful European supervision, it is doubtful if much success will ever be obtained with it.

* Revised figure.

As in previous years we have had numerous enquiries about Lemon-grass oil, and Maung Shwe Thwin, the well known advocate of Moulmein, has had considerable success with the extraction of the oil which he can sell locally at 8 annas per ounce. This is an exceedingly good price.

Experiments with *Paspalum dilitatum* and *Guinea* grass in Akyab failed, as might have been expected. The importance, however, of fodder crops for Arakan is so great that any experiment is justified which gives any promise of success.

During the year the Department had numerous indents for castor seed which bids fair to become an important crop in the Province.

The Inspector-General of Prisons experimented with imported Soy Beans at various jails throughout the Province but the results obtained were very disappointing. Our experiments over two seasons in various parts of the Province seem to indicate that our chances of success with exotic varieties of this plant are very small.

No tea seeds were asked for last year but Arabian and Liberian Coffee was again distributed to various districts. I do not think that any good whatever is done by these distributions.

Jute succeeded in Thatôn but difficulty was found in obtaining a purchaser. Through the kindness of the Burma Chamber of Commerce the growers were introduced to Rangoon firms who were willing to take the crop at Rs. 40 per 100 viss. I have however been unable to ascertain what happened as the report of the Deputy Commissioner, Thatôn (as to the disposal of the crop) was absolutely inaccurate.

Tadaungbo paddy was tried with success in several districts. The usual distribution of English vegetable seeds was again made; but, in the future, this distribution will be limited to isolated frontier stations and to the Chin Hills and Shan States.

The whole question of seed distribution will be discussed at the next Departmental Conference.

A series of experiments on the lines suggested by Mr. La Touche for the solution of the "taungya" problem were carried out at Pyintha in the Maymyo Subdivision but ended in complete failure owing to the depredations of wild animals and the lack of supervision by the villagers. The whole question of "taungyas" has been considered on the agricultural side and various definite conclusions arrived at. These will, shortly, be published.

Chemistry.

24. Mr. Warth, M.Sc., Agricultural Chemist, was in charge of the chemical work of the Department till the 27th March 1912 when he proceeded on six months' leave. During his absence Mr. Darabsett, B.Sc., First Assistant, is carrying on the current duties of the branch.

During the period under report the following analyses have been carried out :—

Silt determinations	34
Soil analyses	48
Paddy analyses (organic 42, inorganic 42)	84
Jaggery samples	5
Miscellaneous	4
Total ...	175

In addition to the above much time has been taken up in devising and testing methods for paddy analysis.

During the year a chemical examination of paddy mill products has been completed and a paper dealing with the subject is in course of preparation. An elaborate scheme of pot, plot and field experiments has been devised to determine the effects of different soils upon the chemical composition and market value of some paddy varieties.

Reports have also been prepared on some Meiktila paddy soils and on the Mohnyin Valley sugarcane and soils; and a Note on the Available Manures of Burma has also been published.

Mr. Warth did various short tours in connection with local enquiries and conducted the Diploma Examination in Chemistry at the Coimbatore Agricultural College.

Botany.

25. Mr. Sawyer's time was fully occupied with the completion of his exhaustive survey of the Peas and Beans of the Province and of the Burmese wheats. The former is practically completed, but some of the wheats will have to be grown another season. In both these enquiries he is collaborating with Mr. Thompstone. A survey of the jowars has also been undertaken; but this will be a matter of some considerable time.

In collaboration with Mr. McKerral he is working on the Sesamums to determine:—

(*a*) the varietal characters of the plants under cultivation;

(*b*) the conditions which determine the occurrence of "reversion" or "atavism."

With the same officer he is studying maize to determine:—

(*a*) the varietal characters and the extent of crossing;

(*b*) heredity and the splitting of types.

The inception of the study of the oils—fixed and essential—of Burma is deferred pending the opinion of the Director of the Imperial Institute.

At the request of the Agricultural Chemist Mr. Sawyer gave assistance in the examination of the paddy plants grown in the pot-culture house. The work is intended to establish, if possible, some correlation in the growth of the plants with the manurial treatment accorded them and will be depicted by graphs representing curves of relative growth and vigour.

Mr. Sawyer gave much advice on botanical references and conducted a course of lectures during the season.

The Artist Assistant, Way Ta Yin worked well during the year.

In order to provide the Deputy Director, Southern Circle, with a man trained in Botany, plant breeding and selection to assist him at Hmawbi, Mr. R. Beale has been posted for a two-years' course of training to the Poona Agricultural College.

Entomology.

26. During the year Mr. Shroff has made useful additions to the Museum in the form of specimens of animal parasites, grasshoppers, fruit flies, coccids and other field crop-pests.

An important discovery was made in the Government House Garden at Maymyo. Mr. Shroff there found a parasite of the mango-weevil, and, as it appeared to be a new species, specimens of male and female parasites were sent to the Imperial Entomologist, Pusa. Specimens of the Burma mango-weevil were also sent to the same officer to ascertain whether they are the same as those which exist in India. The Imperial Entomologist has asked Mr. Shroff to work out its life-history.

Mr. Shroff also conducted an interesting series of experiments on the elimination of white-ants. The result was to show that the injection of Carbon bisulphide is the most efficient remedy for the extermination of white-ant colonies as its fumes penetrate the innermost chambers of the nests and kill the breeding females. The percentage of success with Carbon bisulphide was 56: while with pure water it was only 11 and with sulphur and yellow arsenic 29.

Interesting experiments were also made on Red Spiders for which a solution of soap proved the most effective treatment: on *brown coccids* and on the Swarming Paddy Caterpillar (ကြက်ဘဲကောင်) which were got rid of by the simple process of attracting paddy-birds to the affected areas.

Interesting experiments were also made on the Peach fruit flies of Maymyo. An enormous amount of damage is caused every year to peaches in this Province by a species of fly identified by Mr. Froggatt, Government Entomologist, New South Wales, as *Dacus ferrugenus* (?) var. It is a distinct species from the Indian peach fly. Like the latter its males are attracted by the smell of citronella oil. Large numbers were thus entrapped, the males congregating

on branches on which citronella oil had been rubbed. This experiment shows with what facility the pest can be checked. If, from the beginning of the season, the males are continually destroyed before they mate, the propagation of the insect and the damage to the fruit may be greatly diminished. As it is, hardly any sound fruit is met with towards the end of the season.

Mr. Shroff also made various collections for other Entomological workers: answered numerous enquiries for advice: delivered lectures to students and compiled various Bulletins and leaflets on Entomological subjects.

Great difficulty is experienced in obtaining assistants for the laboratory. The Buddhist aversion from taking life makes Entomology unpopular with the Burman while one cannot easily obtain Natives of India with the necessary intelligence at the pay we are prepared to give.

Sericulture.

27. The reports and suggestions of Messrs. Sawyer and Shroff on Sericulture and Ericulture were discussed at the Departmental Conference in June. The attempt to breed Eri worms at Mandalay has failed. It was pointed out that Ericulture has never been successful on a commercial basis in any country; while it is doubtful whether Erisilk would be popular with Burmans being very coarse in texture. It seems to succeed only as a small cottage industry when the produce is locally utilised.

With regard to Sericulture it is felt that so far as Burma is concerned it is a subject of secondary importance. At the present stage of development it is the duty of the Department to concentrate on main issues—the Lower Burma paddies and the main staples of the dry zone. At the same time Sericulture is a question which may have much importance in the future. Much of the decline of the industry, in India and Burma, is due, not so much to internal causes, as to the fact that Japan has lavishly expended money on the improvement of the industry by the establishment of a Silk Conditioning House and by other methods and that Indian and Burmese silk can no longer hold its own in competition with Japanese. That improvement, however, has meant money to the Japanese, and in Burma, we have, in the meantime, no money wherewith to emulate Japan.

Mycology.

28. Mr. McKerral has directed attention to the condition of paddy known as "gwabo", "shat-na" "gwin-na" or "nido-na." This condition is marked by failure of the grains to fill, the ears consisting of the empty glumes only and being usually slightly discoloured. It is considered by far the most serious blight in the Province.

An investigation of this condition has been undertaken by the staff at Mandalay. In view of the seriousness of the matter a visit of the Imperial Mycologist may be necessary to investigate and advise on it.

CHAPTER IV.

DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

Demonstration: Aid to the Public.

29. As noted last year no real demonstration can be done till a staff, such as the District Agriculturists, is available.

An increasing amount of assistance is given to the public either by answers to enquiries addressed to the Department or by actual visits to farms where practical advice is given on the spot. Demands for such advice are annually increasing while the public are visiting the Mandalay Station in much greater numbers than formerly.

Shows.

30. The Bhamo Agricultural and Live Stock Show was held on the 15th March 1912. The produce classes were, as usual, very good but ponies and cattle were inferior, the

only class of any quality being the draught buffaloes. For next year the classes for stock have been considerably reduced and those for produce increased.

A grant of Rs. 600 was made to the Show of the Agri-Horticultural Society held at Rangoon, but the Department did not send an exhibit this year.

General progress.

31. A year's absence from a Department which one has started and with which one has been associated from the beginning, enables one to realise more clearly the progress which has been made. I feel that the Department has now settled down to useful and practical work; that we understand better the relative importance of enquiries and the lines upon which experiment must first proceed.

I desire to endorse all that Mr. Clayton wrote in paragraph 25 of last year's Report, as to the benefits which accrue from the combination of Co-operative Credit work with Agriculture, and I recognise that in these Societies we have a medium which will be of great assistance in giving practical effect to scientific conclusions.

I would just add that it is becoming clearer every year that we must have small demonstration or seed production plots in the midst of these Societies. Proposals to this effect will be submitted when funds and men are available.

CHAPTER V.

AGRICULTURAL ENGINEERING.

Nil.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Publications.

32. During the year the followig cultivators' leaflets were issued.

No.	Subject.	Author.	Languages.
1	2	3	4
28	Two useful rice pounders used in the Shan States.	Mr. E. Thompstone, B.Sc. ...	English and Burmese.
29	Cultivation of castor-oil plant ...	Do. ...	Do.
30	List of implements recommended by the Department.	Do. ..	Do.
31	What kind of paddy to grow and how to obtain pure seed.	Do. ...	Do.
32	The common Hairy Caterpillar	Mr. K. D. Shroff, B.A. ...	Do.
33	Fruit flies	Do. ...	Do.
34	The Spotted Boll Worm ...	Do. ...	Do.
35	The Brown Coccid ...	Do. ...	Do.
36	The cultivation of the Para Rubber Tree in Burma.	Mr. A. M. Sawyer ...	Burmese only.
37	Field Crickets	Mr. K. D. Shroff, B.A. ...	English and Burmese.

The following publications were also completed and issued during the year.

BULLETINS.

No. 6.—Sugarcane in Burma: by J. MacKenna, I.C.S., Director of Agriculture and F. J. Warth, M.Sc., Agricultural Chemist.

No. 7.—The cultivation of the Para Rubber Tree in Burma by A. M. Sawyer, Assistant Botanist.

MISCELLANEOUS.

1. Report on the Source, Supply and Agricultural Value of Silt in Burma: by F. J. Warth, M. Sc., Agricultural Chemist.

2. Report on Sugarcane Cultivation in the Mohnyin Valley, Katha District: by F. J. Warth, M. Sc., Agricultural Chemist.

3. Note on the Available Manures in Burma: by F. J. Warth, M. Sc., Agricultural Chemist.

Supply of information.

33. The number of enquiries addressed both to this office and to those of the Deputy Directors increase annually. It is gratifying to find that the direct correspondence with Burmans is steadily on the increase. The principal subjects of enquiry have this year again been rubber and castor while we have had numerous enquiries also about tobacco and plantain and other fibres.

CHAPTER VII.

MISCELLANEOUS.

Poultry Breeding.

34. The original stock of Partridge Wyandottes and Orpingtons received from Pusa have not turned out very well and Mr. Thompstone has come to the conclusion that Plymouth Rocks are the birds best suited to Burma. A number of birds and settings of eggs have been sold and an improved strain of fowls is noticeable in the villages around the farm. The poultry branch is, of course, only a subsidiary one and is already practically self-supporting.

Departmental Conferences.

35. These have now been organised and will meet every six months. Many of the subjects discussed are of such general importance and interest that I propose to have the proceedings printed and circulated to Commissioners and District Officers. The Registrar, Co-operative Credit Societies, and his staff are members of the Conferences.

Conclusion.

36. I desire to record my appreciation of the excellent work which has been done by the staff during the past year. I would also note the continued interest of District and Settlement Officers in the Department and the cordial assistance which they are always ready to give. With the Burma Chamber of Commerce the Department is in closer touch than ever: and I trust that this unity of purpose as regards the agricultural development of the Province may find its manifestation in the enhanced prosperity of Burma.

J. MACKENNA,
Director of Agriculture, Burma.

MANDALAY, *17th August* 1912.

APPENDICES.

PAGE

APPENDIX I.—Statement of receipts and expenditure for experimental cultivation during 1911-12. 15

APPENDIX II.—Administration Reports of the Agricultural Stations, Mandalay and Hmawbi, for 1911-12. 16—21

APPENDIX I.

Receipts and expenditure for experimental cultivation during the year 1911-12, *exclusive of the Agricultural Stations, Mandalay and Hmawbi.*

No.	Stations.	Budget allotment.	Receipts from the sale of produce.	Expenditure.							
				Establishment.	Wages of farm and maistries coolies.	Feed and upkeep of stock.	Purchase of seed and fruits trees.	Upkeep of gardens, fencing and trenching.	Purchase of live stock and agricultural implements.	Miscellaneous contingencies.	Total.
1	2	3	4	5	6	7	8	9	10	11	12
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Bhamo (Sinlumkaba).	2,514	126	900	...	...	43	134	...	...	1,077
2	Chin Hills (Falam and Tiddim.)	1,528	278	924	...	...	29	10	...	166	1,129
3	Myitkyina ...	1,443	208	918	...	...	238	266	...	20	1,442
4	Southern Shan States (Taunggyi)	4,363	776	2,963	...	...	...	211	77	38	3,289
5	Distribution of seed from headquarters.	2,800	...	...	...	...	1,451	...	...	...	1,451
6	Distribution of Agricultural implements.	500	...	...	...	...	...	...	...	...	...
7	Sericulture ...	300	...	..	...	...	...	...	...	...	...
	Total ...	13,448	1,388	5,705	...	...	1,761	621	77	224	8,388

APPENDIX II.

ADMINISTRATION REPORT OF THE MANDALAY AGRICULTURAL STATION FOR THE YEAR 1911-12.

1. *General.*– During the year under report the whole area (430 acres), with the exception of about 59½ acres occupied by buildings, compounds, metalled roads, poultry and grazing ground, has been under cultivation. As in previous years many permanent and valuable improvements, which will eventually tend to reduce the working expenses of the farm, have been carried out. The work has largely been a continuation and extension of that of previous years, though some crops (*e.g.*, wheat) have practically dropped out of experimental cultivation owing to the unsuitability of the soil whilst new experiments have been commenced with others. Owing to the large demand for improved and selected paddy seed, considerable areas have been devoted to seed production, from stock which has been "line bred" and selected on the farm. In order to meet the future demand it will be necessary to make considerable extensions in this direction. The nature of the soil and other conditions make it impossible to produce the very best seed of any of the dry zone cereals, pulses or cotton; but as no other dry zone farm exists at present we have been forced to produce seed of such of these crops as will grow at all in order to supply to applicants. Although we have been fairly successful in this respect the practice is far from satisfactory and suitable sites for these crops are badly needed. Although the season was not a good one owing to untimely and badly distributed rains, the crops have, on the whole, been good and the yields satisfactory. The ordinary produce sold well at the highest market rate and a large quantity of seed was disposed of at rates above the market price. We are greatly handicapped for want of storage space for grain. In fact we had scarcely enough space to store the selected grain required for seed purposes. At harvest time we were forced to sell large quantities of produce at comparatively low rates as our store rooms were insufficient. Later there was a rise in market prices of more than 50 per cent. which we could have taken advantage of had we been able to hold our stock. The extra money realised would have more than covered the cost of new godowns. It is proposed to increase the accommodation before next harvest by building a new granary composed of four new paddy bins.

The Agricultural and Co operative Conference of July 1911 brought the farm into touch with a large number of people and greatly increased the demands for seed and implements.

2. *Staff.*—The staff now consists of one Superintendent, one Overseer, five Sub-overseers and two Probationers, but owing to the many changes which have taken place during the year, the establishment has seldom been at full strength.

Maung Aung Dun still remains as Superintendent and manages the Station with great skill. Maung Tin I, Probationer, was promoted to a Sub-overseership on the 17th August 1911 and no one was appointed in his place until February 1st, 1912, when Maung Tin II, a student, was selected to fill the vacancy. One Sub-overseer Maung Tun Hla was transferred to the Co-operative Credit Department on October 19th, 1911, and his place remained vacant till Maung Ba Thein, a student, received the appointment on February 1st, 1912. Mr. T. D'Castro, Probationer, resigned on May 31st, 1912, to practice agriculture on his own account and Maung Maung Gyi, a student, was appointed to fill the vacancy on June 1st, 1912. On the same date, June 1st, Maung Ba Thein, Sub-overseer, and Maung Maung Gyi, Probationer, were promoted to the temporary posts of lecturers, and Maung San took the place of Maung Maung Gyi as Probationer (temporary) on June 7th, 1912. At the end of the year there remains one vacancy as Sub-overseer caused by Maung Ba Thein's promotion and a second one (also sub-overseer) owing to Maung Tha Dun's departure on June 3rd on combined leave for six months.

3. *Houses.*—The following members of the staff have each built a small house with the aid of Government loans and are comfortably accommodated on the farm—much to the benefit of the work in hand and the farm generally.

I. Maung Aung Dun, Superintendent.
II. Maung Po Myat, Overseer.
III. Maung Tha Dun, Sub-overseer.
IV. Maung Tha Zan, Sub-overseer.
V. Maung Po Min, Sub-overseer.
VI. Maung Tin I, Sub-overseer.
VII. Mr. Sawyer, Assistant Botanist.
VIII. Maung Po Saw, Assistant Chemist.

Each man was allotted free a suitable site of a size according to the style of house he proposed to build, and with the exception of Maung Po Saw's house the building of which was not commenced till almost the end of the year, all the houses are now completed and occupied.

Permanent quarters for a few at least of the coolies are badly required for reasons which have already been pointed out on several occasions. It is almost impossible to keep labour and have it available at the right time unless some sort of accommodation is provided.

4. *Water-supply.*—This is our principal difficulty at the present time. The tube well has been down for more than four years and the engine working for two years, but we have still no efficient water supply. The water has to be carted by bullock cart, there is only a small temporary tank and the engine has consequently to be kept running for long hours, and usually started twice a day, in order to provide sufficient drinking water. The *extra* expense incurred amounts to Rs. 87-8-0 per month or about Rs. 1,050 per year. This is about half the cost of the installation required and would be saved if a proper tank and small pipe line were provided. The work has been in the hands of the Public Works Department since the well was put down but no progress has been made.

5. *Labour.*—Labour is still very expensive but if we obtain a proper water-supply it will be possible to considerably reduce the cost of this item in future. A considerable part of the money spent on this account was expended on laying out of new areas, levelling, making kazins and other similar improvements. Moreover, so much casual labour, such as we are forced to employ in the absence of housing accommodation, is more expensive than a staff of permanent coolies would be.

6. *Cattle.*—Cattle remain in numbers the same as last year though there is a slight depreciation in value owing to the ageing of two or three pairs of bullocks. They have remained healthy throughout and are looking as well as can be expected during the period of strenuous work. The "Izal" tank is very useful and the freedom from foot-and-mouth disease may be attributed, to some extent at least, to its use.

Fodder and foods.—The whole of the fodder is provided from the farm and there is a good surplus of paddy straw. Chaffed *pyaung*, either alone or mixed with chopped paddy straw is fed so long as it lasts and as it was plentiful last year the expenditure on oil-cakes and bran was reduced by about one-half.

Manures.—The stable manure has, as before, been procured from the Mandalay Municipality and from the 25th Mule Corps. No artificial manure was bought during the year; we have still small quantities of Nitrolim, Nitre, Superphosphate and Bone-meal in stock. Six cwts. of Basic slag have been received from Chandanagore, Bengal, and its manurial value will be tested. The cattle manure tanks remain as last year no steps having been taken to build the new ones asked for and long ago taken in hand by the Public Works Deparment. These tanks were very badly required as we now suffer a great deal of loss from improper storage of manure.

Implements and Machinery.—Though the expenditure under this head appears to be very large it was chiefly incurred in the purchase of implements for resale to the cultivators and a large sum (Rs. 1,213-6-0) was recovered during the year by sales. Moreover, there still remains unsold a number of new implements, in addition to those which are out on loan or on trial and several have lately been applied for and will be shortly despatched to the applicants. The new scheme for distribution of implements to cultivators, for which a grant of Rs. 5,000 has been made by Government, comes into force from the beginning of the year so that in future it should be unnecessary to draw upon the funds of the farm for this purpose. The Implement Depôt is on the farm and will be in charge of the staff. The chief item of expenditure on account of the farm itself was the purchase and erection of a threshing mill at a total cost of Rs. 2,070. This machine being suitable only for a large holding such as the Government Farm it was not installed as an object lesson to be copied by cultivators, but in order to reduce expenditure and expedite work. It is estimated that the saving in threshing expenses for the year was upwards of Rs. 550. The demand for other implements continues to be met as far as possible. The "Set-tun" has been distributed in comparatively large numbers and has proved very successful. The "Bee-loo" plough also appears to be increasing in popularity among agriculturists. Winnowers have been found very useful especially for paddy sale societies and our stock was exhausted before all the applicants were supplied with machines.

9. *Seeds and Produce.*—Produce has increased in quantity and been improved in quality. Seed selection, production and distribution has taken a much more prominent place that in previous years in the working of the farm. Receipts from sales of produce amount to Rs. 6,852-8-5, almost double the sum realised last year. Seeds were distributed free to the value of Rs. 462-13-7, and by book transfer through the Director of Agriculture to the amount of Rs. 113-7-7. The value of produce on hand amounts to Rs. 2,126-10-0.

10. *Permanent improvements.*—No new stone roads were made but several of the mud roads of the farm were improved by the addition of earth from drains many of which have been cleaned out. The planting of a live hedge round the farm for which the Public Works Department have allowed a sum of Rs. 800, is proceeding as quickly as weather conditions permit.

11. *Accounts.*—Attached is a short statement of receipts, expenditure and produce in hand on July 1st, 1912.

Statement showing receipts of the Agricultural Station, Mandalay, for the year ending 30th June 1912.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SALE OF FARM PRODUCE.		
Paddy	6,534 8 5	
Gram	62 4 0	
Groundnuts...	15 8 0	
Pè-di-sein (Green-gram)	8 0 0	
Wheat	198 6 0	
Oat	5 2 0	
Pyaung or Jowar Stalk...	28 12 0	6,852 8 5
Value of Implements distributed :—		
Sale of Implements	1,213 6 0	
Implements Book-transfer through the Director of Agriculture ...	.....	
Implements distributed free	.....	1,213 6 0
Value of seed distributed :—		
Seed distributed free	349 6 0	
Seed Book-transfer through the Director of Agriculture ...	113 7 7	462 13 7
Hire of winnowing machine	9 0 0	
Hire of Farm carts	25 6 0	34 6 0
		8,563 2 0
Value of produce on hand :—		
Paddy	738 0 0	
Wheat	156 0 0	
Gram	84 0 0	
Cotton	12 0 0	
Linseed	5 6 0	
Jute	35 0 0	
Oat	30 0 0	
Pè-sein-gon (Pigeon Pea)	8 0 0	
Mat-pè (Black-gram)	54 0 0	
Pè-di-we (Yellow-gram)	9 4 0	
Paddy Straw	400 0 0	
Pyaung or Jowar Stalk	500 0 0	
Miscellaneous seeds	95 0 0	2,126 10 0
GRAND TOTAL ...		10,689 12 0

Statement showing the expenditure of the Agricultural Station, Mandalay, for the year ending 30th June 1912.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SUPPLIES AND SERVICES.		
Wages of Farm maistries and coolies	10,594 8 1	
Feed and upkeep of stock	423 11 0	
Purchase of seed and fruit trees	222 10 0	
Upkeep of garden, fencing and trenching	776 14 4	
Purchase of live-stock and agricultural implements	5,199 4 7	
Petty construction and repairs of work	1,360 1 2	18,577 1 2
Contingencies :—		
Service, postage and telegram charges	20 0 0	
Purchase of furniture	33 13 6	
Freight, shipping and landing charges	433 1 3	
Purchase of books and periodicals	.....	
Office expenses and miscellaneous	1,047 12 0	1,534 10 9
		20,111 11 11
Includes labour expended for Agricultural Chemist	264 0 0	
Includes labour expended for Assistant Botanist	336 0 0	
Includes labour expended for Assistant Entomologist	65 0 0	665 0 0
GRAND TOTAL ...		19,446 11 11

E. THOMPSTONE,

MANDALAY, *17th August 1912.* *Deputy Director of Agriculture, Northern Circle.*

ADMINISTRATION REPORT OF THE HMAWBI AGRICULTURAL STATION FOR THE YEAR 1911-12.

1. *General.*—The Station, as at present organised, is intended for experiment with paddy only, and for the distribution of improved paddy seed. At the beginning of the year 30 acres had been laid out in half-acre plots and the roads and watercourses necessary for this area constructed. Laying-out operations were continued from the end of the rains till the beginning of May with the result that at the end of the year about 70 acres including roads and watercourses have been prepared for experimental work. As a result of observations during the growing season of 1911 it was found that for quantitative experiments in which a comparatively high degree of accuracy is necessary the half acre plots appeared to be too uneven. Accordingly one of the sections was subdivided into plots of ·09 acre in area. There are now 80 such small plots available for experiment.

2. *Experimental work* (*a*).—The 30 acres laid out in half-acre plots were sown with one variety of paddy, Ngasein, with a view to ascertaining their suitability for quantitative experimental work. As noted previously the yields were very unequal with the result that the series of small plots of ·09 of an acre had to be constructed. The average yield of paddy got on the half acre plots was 30 nine-gallon baskets to the acre.

From the paddy so grown a rough hand selection of the best heads and elimination of red grain was done on the threshing floor. The seed so selected has been sown this season and the resulting crop will be available for distribution at the end of the present harvest.

(*b*) An experiment was designed and has been started with a view to investigating the nature and mode of occurrence of red grain in rice. About 400 single-ear cultures have been put down, 200 of them from a sample of paddy sent by the Registrar, Co-operative Credit Societies, from Katha, where the cultivators complained of their inability to get rid of it by the ordinary process of hand selection on the threshing floors, and 200 others were made from Ngasein paddy grown at Hmawbi. These cultures are under observation at present and results will be published in due course. Incidentally it is hoped that this work will furnish evidence on the extent of natural cross-fertilization in the rice crop, a point of the greatest importance in seed selection and distribution.

(*c*) A survey of the varieties of paddy grown in the Lower Province has been undertaken. About 300 samples have been received from District Officers. These, after a preliminary arrangement and classification have been put down in separate plots and are at present under observation. Hand selection of superior ears will be done from them.

Staff.—On return from privilege leave in June 1911 I took over charge of the station from the Deputy Director of Agriculture, Northern Circle. During the year it was entirely under my control. The subordinate staff consisted of three Sub-overseers, Maung Ba I, Maung Po Than and Maung Ba II. Maung Ba I has since been raised to the rank of Overseer. An important part of the work consisted in the training of these men especially in the technique of seed selection by modern methods. Their work, without exception, was characterized by neatness, accuracy and desire to learn and has been so far entirely satisfactory. It is a drawback, however, that the Overseer cannot speak or write English.

4. *Labour.*—As no buildings have been erected and as no grant was available for the purchase of cattle resort had to be made to hiring cattle and labour from the village. This is obviously unsatisfactory and the erection of farm buildings and the purchase of cattle which it is hoped will be effected during the ensuing season will greatly facilitate the work of the station.

Sales of grain.—The sum of Rs. 1,195-14-4 was obtained from the paddy grown on 30 acres cultivated during 1911. This was sold to brokers in the usual way and no selected seed has as yet been available for distribution to cultivators or Co-operative Credit Societies. The value of produce kept for seed amounts to Rs. 165.

Expenditure.—The following table gives the expenditure incurred during the year ending the 30th June 1912.

Statement showing expenditure of the Agricultural Station, Hmawbi, for the year from 1st July 1911 to 30th June 1912.

——	Amount.	Total.
1	2	3
SUPPLIES AND SERVICES	Rs A. P.	Rs. A. P.
Wages of Farm Maistries and Coolies	3,375 10 0	
Feed and Upkeep of Stock	...	
Purchase of seed and fruit trees	56 1 6	
Upkeep of garden, fencing and trenching	1,248 14 8	
Purchase of Livestock and Agricultural Implements	197 0 0	4,877 10 2
CONTINGENCIES.		
Service postage and telegram charges	10 0 0	
Purchase of furniture	...	
Freight, shipping and landing charges	27 13 0	
Purchase of books and periodicals	...	
Office expenses and miscellaneous	93 13 0	
Rent, Rates and Taxes	21 0 0	152 10 0
Grand Total ...	...	5,030 4 2

A. MCKERRAL,
Deputy Director of Agriculture, Southern Circle.

INSEIN, *August* 1912.

G. B. C. P. O.—No. 48, D. of A., 4-11-1912—513—J. T. N.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ended the 30th June 1913

RANGOON

OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, BURMA

1913

133917

LIST OF AGENTS

FOR THE

SALE OF GOVERNMENT PUBLICATIONS.

IN INDIA:

THACKER, SPINK & Co., Calcutta and Simla.
W. NEWMAN & Co., Calcutta.
THACKER & Co., Bombay.
HIGGINBOTHAM & Co., Madras.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
* D. B. TARAPOREVALA & SONS & Co., 103, Meadow Street, Fort, Bombay.
BUTTERWORTH & Co. (INDIA), LTD., 8-2, Hastings Street, Calcutta.

IN ENGLAND:

HENRY S. KING & Co., 65, Cornhill, E.C., London.
CONSTABLE & Co., 10, Orange Street, Leicester Square, W. C.
KEGAN PAUL, TRENCH, TRUBNER & Co., 68—74, Carter Lane, E. C.
BERNARD QUARITCH, 11, Grafton Street, New Bond Street, W.
P. S. KING & SON, 2 & 4, Great Smith Street, Westminster, S W.
GRINDLAY & Co., 54, Parliament Street, S. W.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
DEIGHTON BELL & Co., Cambridge.
W. THACKER & Co., 2, Creed Lane, London, E. C.
LUZAC & Co., 46, Great Russell Street, London, W. C.
OLIVER & BOYD, Tweeddale Court, Edinburgh.
E. PONSONBY, Limited, 116, Grafton Street, Dublin.

ON THE CONTINENT:

R. FRIEDLANDER & SOHN, 11, Carlstrasse, Berlin, Germany.
OTTO HARRASSOWITZ, Leipzig, Germany.
KARL W. HIERSEMANN, Leipzig, Germany.
ERNEST LEROUX, 28, Rue Bonaparte, Paris, France.
MARTINUS NIJHOFF, The Hague, Holland.

---

* For the sale of official publications excluding those of the Legislative Department of the Government of Burma.

[The maximum limit of the body of the Report is 12 pages.]

TABLE OF CONTENTS.

REPORT ON THE OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA, FOR THE YEAR ENDED THE 30TH JUNE 1913.

CHAPTER I.—ADMINISTRATION.

PARA.		PAGE
1.	Personal	1
2.	Tours	*ib.*
3.	Staff	*ib.*

CHAPTER II.—AGRICULTURAL EDUCATION.

PARA.		PAGE
4. 5. 6. 7.	Agricultural Education	1 & 2
8.	School Gardens	3

CHAPTER III.—AGRICULTURAL RESEARCH AND EXPERIMENT.

9.	The Deputy Director, Northern Circle	3
10.	The Deputy Director, Southern Circle	*ib.*
11.	Agricultural Stations	4
12.	Experimental Gardens	5
13.	Taunggyi, Southern Shan States	*ib.*
14.	Myitkyina	*ib.*
15.	Chin Hills	*ib.*
16.	Financial aspect	6
17.	Experiments through district agency	*ib.*
18.	Wheat	*ib.*
19.	Cotton	7
20.	Tobacco	*ib.*
21.	Castor and Croton seeds	8
22.	Sugar-cane	*ib.*
23.	Miscellaneous	*ib.*
24.	*Taungyas*	9
25.	Chemistry	*ib.*
26.	Botany	10
27.	Entomology	*ib.*
28.	Mycology	11

CHAPTER IV.—DEMONSTRATION, ETC.

29.	Demonstration—Aid to the Public	11
30.	Shows	*ib.*
31.	General progress	*ib.*

CHAPTER V.—AGRICULTURAL ENGINEERING.

Nil.

CHAPTER VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

32.	Publications	12
33.	Supply of information	*ib.*

CHAPTER VII.—MISCELLANEOUS.

34.	Poultry breeding	12
35.	Departmental Conferences	*ib.*
36.	Conclusion	*ib.*

From C. R. P. Cooper, Esq., I.C.S., Assistant Secretary to the Financial Commississioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 209—5R.-86, dated the 10th October 1913.

I am directed to submit five copies of proof in book form of the Report on the operations of the Department of Agriculture, Burma, for the year ending the 30th of June 1913. The Report is an interesting one and bears testimony to a year of useful work.

2. There are two points in the Report which call for special notice. One is that the Education Department has shown its willingness to amend the curriculum of work in primary and middle schools, so as to allow instruction in an elementary study of plant life and agriculture in primary schools and similar provision to be made for the teaching of agriculture in the middle standards, and eventually that agriculture should be taught in all schools. The practical development of education in this direction is a distinct advance. Hitherto the ideal employment held out to the successful scholar was the life of a clerk in a Government office. This departure coupled with the grant of Rs. 5,000 by the Government of India, part of which is to be used for the agricultural education of the sons of landholders, should be of great advantage, not only in widening the scope of school work, but in interesting the people themselves in agriculture.

3. The second point, to which Mr. Eales wishes to bear testimony, is to the good work done by the present Director and his predecessor in coming into closer touch with the cultivators by means of utilizing the Co-operative Societies in the popularization of improved agricultural methods. However valuable an Agricultural Department may be to the State, until it is brought into touch with the cultivators themselves the chief value of such a department is not secured. The Co-operative movement and the Agricultural Department must work hand in hand, and Mr. Eales is satisfied that Mr. Clayton is doing his best to obtain this result.

4. The department is to be congratulated on the selection of its previous Director, Mr. MacKenna, to be Agriculture Adviser to the Government of India and Director of the Agricultural Research Institute, Pusa.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE, BURMA,

For the year ended the 30th June 1913.

CHAPTER I.

ADMINISTRATION.

Personal.

1. Mr. J. MacKenna, I.C.S., was in charge till the 22nd February 1913 when he left to take up the appointment of Officiating Agricultural Adviser to the Government of India.

I officiated as Director for the remainder of the year, and also from the 23rd February to the end of May officiated as Registrar of Co-operative Societies. The volume of work involved by the simultaneous charge of the two offices during the busy season was very great and the administration of both Departments suffered.

Tours.

2. During the year 197 days were spent on tour—119 by Mr. MacKenna and 78 by me. The following districts were visited:—Rangoon Town, Insein, Hanthawaddy, Pegu, Prome, Tharrawaddy, Toungoo, Henzada, Ma-ubin, Pyapôn, Yamèthin, Meiktila, Sagaing, Shwebo, Katha, Myitkyina, Pakôkku, Minbu and Magwe.

Mr. MacKenna also attended the Conference of Registrars of Co-operative Societies at Simla during October 1912.

Staff.

3. The Superior and Subordinate Scientific staff remained unchanged throughout the year.

Proposals have been submitted for a revision of the pay of the Assistants of the Department and for a general increase in the staff to meet the growing needs of the Department and the establishment of an experimental station in the dry zone for the study of cotton and other staple crops.

CHAPTER II.

AGRICULTURAL EDUCATION.

Agricultural Education.

4. The only agricultural education undertaken by the Department during the year under report was the training of district agriculturists. Lectures were given at Mandalay in Agriculture, Chemistry, Botany, Entomology, Fruit culture and Co-operation, and the students were also employed in practical work. As mentioned in last year's report some outside students and certain of the Mandalay farm staff were also permitted to attend the lectures. Sanction has been obtained to the extension of the period of training for another year in the case of the district agriculturists, with a view to their being thoroughly grounded in the methods and principles of seed selection which will form an important part of their duties when posted to their respective districts. No private students are at present under instruction by the Department.

5. The question of agricultural education is an important one and the time has perhaps come when it should be seriously considered. Lack of funds has hitherto prevented the erection of the Agricultural College and will probably continue to do so. There is, however, little sign that there is any demand for the higher education in agriculture which such an institution would provide. Burma is a country of small holders and there are very few of those dependent on agriculture for a living in the Province to whom the expenditure of time and money involved by a residence of two or three years at an Agricultural College would be a sound investment. Students at the present time would in all probability be confined almost entirely to candidates for the higher appointments in the Department. The number of these posts is not large and it is possible to make arrangements for the necessary training of probationers elsewhere at much less cost. It is noticeable that the private students at the district agriculturists' course who numbered thirteen at its commencement had dwindled to seven before its close, in spite of the fact that the instruction given was of a much more simple and practical character than would ordinarily be the case at an Agricultural College.

Higher education in Agriculture will no doubt in time be necessary and should not be lost sight of, but at the present time it is the educational requirements of the working cultivators holding from 10 to 50 acres of land which have the first claim upon the attention of the Department. These men are the backbone of the country and the alacrity with which they are organising themselves into Co-operative Societies and the business capacity which they are displaying in the administration of these institutions indicate that the Department has here a very receptive soil for the inculcation of improved methods of agriculture.

6. Few of these working cultivators continue their education beyond the primary standards, and it is therefore in the primary schools of the Province that agricultural education should begin. The education imparted in these schools should be given as far as possible by means of agricultural and rural subjects and should be directed to rousing the children's interest in the agricultural processes going on about them and giving them a definite bent towards a life on the land. A slight modification of the existing curricula of primary and middle vernacular schools would probably go far to achieve this result. On the initiative of Mr. A. E. Potter, Inspector of Schools, Mandalay, the subject was discussed at the last half-yearly Conference of the Department and his proposals which I understand have been submitted to the Director of Public Instruction met with unanimous approval. Should the change be carried out the Department would be glad to co-operate to the utmost of its power. There is reason to believe that such a modification of the curricula would be welcomed by the teachers generally and in particular by those in charge of the monastic schools where a large proportion of the agriculturists of the Province obtain their education. Equipped by a sound knowledge of the three R's and taught to take an intelligent interest in plant life and the agricultural methods in practice in his village the cultivator would, on reaching years of discretion, be in a position to take full advantage of such improved crops or improved methods of cultivation as the Department might bring to his notice.

7. For the adult population most of whom are already engaged in agriculture a few months spent on one of the experimental farms would probably be the best method of dealing with the problem and it is hoped that a commencement may be made in this direction during the coming year with the assistance of a small recurring grant for agricultural education which has just been sanctioned. Such measures will however affect only an infinitesimal proportion of the agricultural population, and it is to the Co-operative Societies now springing up all over the Province that the Department must look for the spread of improved methods of agriculture. It is not too much to say that organisation is a condition precedent for the establishment of any satisfactory system of education, agricultural or otherwise. Without organisation the efforts of the most gifted teachers will be for the most part without effect, while in a properly organised community valuable results may be obtained from imperfect agencies. This is more

especially the case in the education of adults and it is for this reason that every effort is being made by the Department to maintain the closest possible touch with the co-operative organisations of the Province.

District agriculturists will play an important part in this work and, though the training of the first batch has not yet been completed, it has been found necessary to ask for a considerable addition to the number at present sanctioned.

School Gardens.

8. School gardens are universally recognised as one of the most useful and practical methods of giving the children of a country a bent towards agricultural pursuits and there are signs that in Burma teachers are prepared to take them up with alacrity. This is particularly the case in Kyauksè where Lieutenant-Colonel Cronin, the Deputy Commissioner, has devoted much time and trouble to their encouragement with most satisfactory results. The Reverend E. N. Harris has continued his good work at Shwegyin and Nyaunglebin during the year and some keenness on the subject has been manifested in Moulmein. I trust that the movement will spread rapidly and that a school garden will be before long regarded as part of the necessary equipment of every primary or middle school.

CHAPTER III.

AGRICULTURAL RESEARCH AND EXPERIMENT.

The Deputy Director of Agriculture, Northern Circle (Mr. E. Thompstone).

9. The work of Mr. E. Thompstone, B. Sc., Deputy Director of Agriculture, Northern Circle, has been much on the same lines as in former years. The training of the district agriculturists and other students already dealt with, and the experimental laboratory and office work conducted in Mandalay occupied much of his time. He was, however, on tour for 104 days and visited most of the districts in his circle.

The experimental work at the Mândalay Station has been considerably extended during the year particularly in the direction of the line breeding of paddy and of seed selection and seed multiplication. A plot of riverine land situated three miles from Mandalay at Natywagon has also been taken up for the purpose of experimenting with island crops for which the soil of the farm is unsuitable. Trials have here been made with a sample of Madagascar beans supplied by the Imperial Institute. These beans fetch considerably higher prices on the home market than the varieties at present grown in Burma and their successful introduction into the Province would go far to solve the recurrent bean problem. The results so far obtained are satisfactory but it is too early to come to any definite decision as to their suitability for Burma. Mr. Thompstone as in former years attended the Bhamo Agricultural Show, and also organised a small exhibition of implements for the American Baptist Mission Conference at Nyaunglebin where also he read a paper on seed selection. The small attendance hardly justified the trouble taken.

A more successful venture was the preparation of three lectures in simple Burmese on agricultural subjects for delivery at the Myittha pagoda festival in the Kyauksè District. These commanded a good deal of attention and it is proposed to repeat the experiment in the coming year.

The Kyauksè District formerly belonging to the Southern Circle, has now, in view of its close proximity to Mandalay, been transferred to Mr. Thompstone's charge.

The Deputy Director of Agriculture, Southern Circle (Mr. A. McKerral).

10. Mr. A. McKerral, B. Sc., Deputy Director, was in charge of the Southern Circle throughout the year. His headquarters are at Insein but the most important part of his work was concerned with the development of the Hmawbi experimental station, the administrative report on which is attached to this report.

The selection experiments with rice there in progress are likely to prove of great value.

Outside Hmawbi the Môn Canals area recently brought under irrigation in the Minbu District received a good deal of attention. The soil there is perhaps the most fertile in the Province and the advent of irrigation gives an opportunity for assisting the cultivators to discover the most paying and productive crops. A small experimental station of 10 acres had been opened at Pwinbyu in the centre of this area, the main object being to introduce sugar-cane cultivation on the better class of irrigated land and incidentally to improve the paddy of the locality. Lack of roads and communications are a great source of difficulty in the development of this tract but it is understood that this question has been taken up by the Irrigation Department and that the necessary works will soon be put in hand.

At Tatkon in Yamèthin a small plot of land was taken up for the purpose of the classification of the principal sesamum varieties grown in the Province Initial observations were made by the Assistant Botanist and seed taken to maintain the cultures on a plot of land near Mandalay where better supervision is available. At Tatkon also were conducted experiments with Cambodia cotton seed obtained from Madras. The results were satisfactory, and the trials are being extended through the agency of Co-operative Credit Societies in the current year.

Lack of sufficient staff has considerably hampered Mr. McKerral's work during the year. There is no Superintendent on the Hmawbi Station which is at present under the charge of an Overseer on Rs. 75 a month, and at Insein the Deputy Director has only a single clerk who has not only to cope with the office work but also to accompany the Deputy Director on tour.

Proposals for increased establishment have been submitted which in time will correct these deficiencies. Certain irregularities, however, which were brought to light in the Insein office just after the close of the year indicate that it is desirable to appoint some senior officer as Superintendent as a temporary measure while the man destined to hold the post permanently is being trained. The question of account keeping and the custody of money is becoming important both at Hmawbi and Mandalay. At both stations large sales of agricultural produce take place every year and increasingly in small parcels, as business with Co-operative Societies and individual cultivators develops. Careful supervision by the Deputy Directors is therefore necessary. On the other hand it is important that the experts should be freed as far as possible from office work in order that the progress of the experimental work in hand may not be retarded.

The present arrangements are not I think perfect and an effort will be made to improve them if possible during the coming year.

Agricultural Stations.

11. The administration reports of the Hmawbi and Mandalay Stations are printed as appendices to this report and need not be further mentioned here. No progress was made with the erection of the much needed buildings at Hmawbi during the year but the work has now been put in hand and it is expected that it will be completed by the rains of 1914. At Mandalay the installation of the water supply was commenced but is not yet in working order. An additional grant of Rs. 75,000 was received from the Government of India during the year in addition to the lakh mentioned in the report of last year. This will be employed towards completing the provision for the full equipment of the Department, and in accordance with the Government of India's suggestion proposals have been submitted which include the provision of a dry zone experimental station of 40 acres for the study of cotton and other staple dry crops. For the generosity thus shown to the Department I am most grateful, but when the money already received has been expended the equipment of the Department will still be incomplete and further sums will also be required for the provision of district seed farms and for the commencement of experimental work in the Southern Shan States.

I would therefore express the hope that the benevolence of the Government of India towards the Department may not yet have reached its limit.

Experimental Gardens.

12. As promised in last year's report the whole question of experimental gardens was carefully gone into during the year, and the result of the decision come to is a considerable reduction in their number. The disappearance of those now condemned need not be regretted. Before the establishment of a separate Agricultural Department when all experiment had perforce to be carried out by district agency they had their uses and in several cases were the means of introducing valuable staple crops. Now that the Department has its own experimental stations under expert control they are only valuable as subsidiary agencies, and where they fail to influence local agriculture should disappear.

The gardens which it has been decided to close at once are those at Sinlumkaba in the Bhamo District and at Tiddim in the Chin Hills. The latter has suffered the same fate as that at Haka in the previous year. It has been handed over to the Assistant Commandant of the Military Police Battalion to grow vegetables for his policemen and other residents of the station as he may arrange.

The Sinlumkaba garden will be abandoned from the date on which arrangements are made with the Education Department to take over such of the staff as are necessary for the training of the boys in the local Kachin school which possesses its own garden. It was not possible to take any action on these orders before the end of the year.

Taunggyi, Southern Shan States.

13. It has been decided to close the garden at Taunggyi in the Southern Shan States as soon as a purchaser can be found for it. It is therefore for sale, but will be continued on the same lines as at present until the railway is opened when advantageous offers are more likely to be forthcoming. There is no intention of withdrawing from experimental work in the Southern Shan States, and the future policy to be adopted is under discussion. Lack of funds as usual prevents the adoption of any comprehensive scheme and perhaps it is too early in any case to embark on such, at any rate until requirements in Burma proper have been fully met.

The most promising suggestion in my opinion is the establishment of an experimental station of some 40 acres in close proximity to the railway line under the charge of a trained Assistant. Here experiments in wheat and other staple crops could be conducted, and selected seed distributed to the various States each of which might in time maintain their own seed farm. When the railway is open this station would probably be successfully controlled by the Deputy Director at Mandalay. The Assistant should, if possible, be a Shan but it is doubtful whether a man of the requisite educational qualifications will be found willing to take up the post. The Rs. 3,000 annually spent on the present garden would go some way to meet the cost of upkeep at the new station, but it is difficult to see how the cost of its equipment and the salary and allowances of the Assistant are to be provided while the present stringency in the provincial finances continues. It is probable therefore that for the development of the work of the Department in the States we must rely upon the generosity of the Government of India.

Myitkyina.

14. The results of the first year's working of the Myitkyina garden under the revised scheme are eminently satisfactory. The average outturn of potatoes was 671 viss per acre, which, in view of the late planting due to a delay in the receipt of seed, is a very fair yield. The crop was for the most part kept for a second sowing and it is proposed to begin the distribution of seed next year. Wheat, at 40 baskets an acre, linseed at 168 viss and gram at 9 baskets an acre all gave good records, that of wheat being especially favourable. The local value of the wheat worked out at Rs. 115 per acre with very little trouble spent on the cultivation. It would appear that there is a great future in Northern Burma for both wheat and potatoes, and efforts will be made to encourage the cultivation of both crops, both in the Myitkyina plain and in the rich Namyin Valley.

Chin Hills.

15. The only garden now maintained by the Department in the Chin Hills is that at Falam, which will be retained as a Central Agricultural Station from which new seed may be

made available in case of necessity for the crops already established in the hills and where new experiments may from time to time be tried. Wheat is the most important crop of the hills but it is sufficiently established without the intervention of the garden. It is proposed to experiment in the cultivation of potatoes during the coming year and the results will be awaited with interest. There are no doubt other crops which could be introduced into the Chin Hills with advantage and this question will be considered during the coming year. Unfortunately owing to the remoteness of Falam and the pressure of other more important work it is difficult to arrange for the garden to be visited by the Departmental experts.

Financial aspect.

16. The total expenditure under all heads on the upkeep of the gardens was Rs. 6,229, and Rs. 1,017 was realised from the sale of produce. The net cost to Government was therefore Rs. 5,212 or Rs. 337 less than in the previous year.

Experiments through district agency.

17. The development of the work of the Department which has taken place in the past few years has enabled it to take much of the experimental work formerly conducted through the agency of district officers under its own control.

The organisation proposed by the Department, part of which has been realised while the remainder is contained in comprehensive proposals submitted just before the close of the year, is the establishment in addition to the main experimental stations at Mandalay and Hmawbi of two smaller stations at Tatkon in Yamèthin and Padu in Sagaing District together with small plots at Bugyi near Tantabin in the heart of the unirrigated tract of Shwebo, at Ywathitgyi in the Namyin Valley and at Pwinbyu in the Môn Canals area. On these stations experimental work will be carried out and the improved or acclimatised seed therefrom obtained will be popularised either through seed farms maintained by Co-operative institutions or private enterprise or through similar farms maintained by the Department itself.

The extent to which this organisation can be carried out in the immediate future will depend upon the measure of approval obtained by the proposals already submitted, but in any case it has now become possible to relieve district officers of much of the experimental work formerly devolving upon them though their continued co-operation with the Department will be both welcome and desirable.

For the better systematisation of such experimental work as district officers may still desire to continue a new circular has been issued. Small quantities only of seed will in future be issued free for experimental purposes, and when a plant or variety has been established in any locality cultivators will thereafter be required to pay for any fresh supplies of seed which they may require.

The supply of English vegetable seeds to Deputy Commissioners except for frontier posts and school gardens will be discontinued as it is undesirable that the Department should enter into competition with the other agencies now existing in the Province for their supply. Small supplies will, however, be given to Burmans and others with a view to the encouragement of market gardening, which in some districts is being undertaken on a considerable scale.

In the case of rubber seeds applicants will be referred to a reliable seedsman and experiments in tobacco will only be assisted where precise reports are available and inspection by the Department can be arranged for.

Detailed instructions for the preparation of indents are laid down for cases where experiments with other crops are desired in order that the Department may be in a position to provide the variety of seed most likely to be cultivated with success.

Instructions in Burmese and English will be issued with all seed supplied. It is hoped that the revised arrangements will greatly enhance the value of experiments through district agency, which, as the comments in former reports testify, have in the past often proved the reverse of satisfactory.

Wheat.

18. The cultivation of wheat in the Chin Hills was suspended during 1912-13, the supply having outrun the demand from the Military Police who are the only consumers This

suspension is, however, only temporary and 20,000 lbs. of Shan States wheat have been purchased through this Department by the Superintendent of Police Supplies to provide seed grain for the coming cultivating season.

The Deputy Commissioner, Upper Chindwin, started a small experiment with wheat, but it ended in failure. Seed was also supplied to the Deputy Commissioner, Bhamo, and to the Battalion Commandant. The results were not altogether satisfactory as some of the seed supplied proved unsuitable. It is, however, certain that good wheat can be grown in the Bhamo District, and indeed over much of Northern Burma. The Superintendent of Police Suppiles is actively interesting himself in the question, and whether the cultivation be carried on by the cultivators of the district or the members of the Police themselves I hope that in no long time all the requirements of the Bhamo Battalion may be supplied locally.

Wheat was supplied direct by certain Co-operative Societies in the Sagaing District to the Supply and Transport Department and was found to be of excellent quality.

The new stations which it is hoped to open this year at Ywathitgyi in the Myitkyina District and at Padu in Sagaing will enable the Department to give more practical assistance to the development of the cultivation of this crop than has been practicable in the past. There is no reason why all local demands for wheat should not be met from within the Province itself, and in time an export trade even may be developed.

Cotton.

19. No experiments with cotton seed supplied by the Department were made by district agency during the year. Considerable attention was however devoted to this crop by Mr. McKerral, Deputy Director, Southern Circle, whose experiments at Tatkon have been already mentioned. A very fine crop yielding seed-cotton at 1,200 lbs. to the acre was obtained in spite of serious insect attacks which resulted in the staining and consequent lowering in value of the staple. It is hoped to overcome this trouble by later sowing. Samples were forwarded to the Imperial Institute and the best was valued 6·75*d.* per lb. ginned with "middling" American at 6·57*d.* per lb. The cotton was described as of fairly good quality. It is thus decidedly superior to the local indigenous varieties and its cultivation is being encouraged in the present year in the Kyauksè, Meiktila, Yamèthin and Pakôkku Districts, mainly through the agency of Co-operative Credit Societies.

A fact which has come to light is that by sowing in August or September Cambodia cotton of very good yield and quality can be grown on the higher soils in Lower Burma. A good report has been obtained on cotton grown by a rubber planter in the Henzada District and seeds have been distributed to several rubber plantations in Pegu and Hanthawaddy. The results of these trials will give us much definite information concerning this crop.

Little has been done during the year to keep in touch with tree cotton cultivation in Tenasserim. A sample of this cotton was however sent to the Imperial Institute and was valued at 9*d* to 9¼*d* per lb. ginned with "good" rough Peruvian at 9¼*d* per lb. The cotton was described as of good length and useful quality and it was stated that it would be readily saleable in large quantities in the United Kingdom.

Arrangements will be made for the Deputy Director, Southern Circle, to tour in Tenasserim in connection with this crop during the coming open season.

Tobacco.

20. Sixty-seven half pound tins of Havana and fourteen of Virginia tobacco seed were distributed to district officers but with little or no result. In the Shwegyin Township of the Toungoo District and in Thatôn the experiments ended in failure. The Deputy Commissioner, Kyauksè, points out that until instructors are available to go round and assist the cultivators in the cultivation of the seed and until a ready market is available the attempt to introduce exotic seed is a waste of money to Government and a source of heart-burning to the cultivators. I am afraid that his criticism is largely justified and that we must wait until an adequate staff of district agriculturists is available before new varieties can be introduced with success. In

many cases the failure is probably due to the soil or climate being unsuitable, for in Ma-ubin and Henzada Havana tobacco has for some years been successfully established.

Castor and Croton seeds.

21. Considerable interest has been shown in Castor cultivation during the year particularly in the Kyauksè District where the Deputy Commissioner, Lieutenant-Colonel Cronin, has devoted much time and trouble to the introduction of this crop. The results obtained in the coming year will receive careful attention and I hope that another valuable crop may be added to the resources of Upper Burma.

The Commissioner of Meiktila has made enquiries with regard to the commercial prospects of a trade in the seeds of the *Jatropha curcas* or *goosipyfolia* which grow freely as a weed over much of the dry zone of Upper Burma. It appears that there is some demand for the oil as a lubricant and that good prices are obtainable. It is proposed to have an analysis done at Mandalay as soon as seeds are available, and, should that prove satisfactory, to send a sample to the Imperial Institute for valuation.

Sugar-cane.

22. The question of sugar-cane has received a good deal of attention during the year owing to the good prospects for cane sugar and to the fact that in Burma this industry, unlike cotton and paddy, possesses no proper organisation. The Agricultural Adviser to the Government of India proposed to tour in Tavoy and Mergui in February in connection with this subject. He was however finally unable to come and his tour was taken over by Mr. McKerral, Deputy Director. The results were rather disappointing. No facilities for irrigation exist in these districts and in most of the localities visited the soil is not suitable. Without irrigation no capitalist would care to touch sugar-cane and hence attention has been directed to the Môn Canals area. Here as already stated a small experimental station has been started mainly for sugar-cane, and, as a commercial firm in Rangoon is interesting itself in the matter of the erection of a white sugar mill within the area, there is a probability that sugar-cane as an organised industry may have its first beginnings there. Canes of the best quality have been ordered from the new Government of India sugar-cane station in Madras and from the Natal Agricultural Department. There can be no doubt of the excellence of the soil for sugar-cane cultivation in many parts of the Môn area.

Miscellaneous.

23. There is little to report on the subject of groundnut. The early rains were exceptionaly favourable and a large increase in the area under cultivation was recorded. The area under sesamum also expanded and the year is thus an exception to the rule that an expansion of sesamum cultivation means a contraction of the area under groundnut and *vice versâ*. Groundnut seed has been supplied to several Co-operative Societies in the north of the Pyinmana Subdivision and if the proposed agricultural station at Tatkon is sanctioned it should be possible to secure the successful establishment of this crop in the Yamèthin District.

No rubber seeds were distributed by the Department during the year. It is understood that planters are experiencing some inconvenience from insect and other pests entering their plantations from ill-kept rubber plots outside. Under the orders of Government rubber is dealt with by the Forest Department and we have therefore taken no steps to enquire into the matter.

Coffee seeds continue to be supplied in varying quantities to several districts but for the most part there is little sign of the industry being established on a commercial basis. Excellent coffee is however to be bought in the bazaar at Maymyo. In the Kachin Hills of the Bhamo District coffee gardens are reported to have been established at several villages largely through the agency of the Roman Catholic Mission. The Deputy Commissioner has promised to enquire further into the prospects of this cultivation during his cold weather tours.

Tadaungbo paddy was supplied to the Deputy Commissioner, Sandoway, with partially successful results in areas not very heavily flooded, and also to Amherst. The results of the last named experiment have not been reported.

The initiation of experiments with Madagascar or Lima beans at Mandalay has already been mentioned. An interesting development of this experiment has been the request of the Registrar, Co-operative Societies, for a large supply of these beans for trial by Unions of Co-operative Societies on the riverine lands along the Irrawaddy. Two tons of seed have been ordered and practically every riverine society from Singu to Pakôkku will be taking part in the experiment. Should the beans prove readily adaptable to local conditions and methods of cultivation, the rapid acclimatisation of this valuable crop is to be expected. In any case the zeal with which the societies have embarked upon the experiment is a clear indication of their value as coadjutors of the Department.

English vegetable seeds were distributed to eight Deputy Commissioners, and also to a large number of Burman cultivators and school teachers direct. The best results are reported from the Shan States. As already stated the distribution of these seeds through district agency will be in future considerably restricted.

Taungyas.

24. Further "*taungya*" experiments have been abandoned for the present. The conclusions arrived at as a result of the enquiries of the past six years have been summarised and submitted to Government. Until orders are received upon them no further action will be taken. Except in the higher hills it may be regarded as established that *taungya* cultivation does not as a rule cause erosion and land slips, and there the conservation of existing streams by the reservation of forests at their head-waters is as important to cultivators who utilize their water for irrigation as it is to the Forest Department which uses them for floating purposes. The only practicable course is the complete prohibition of *taungya* cutting in such areas. No manurial or other experiments can possibly be of the slightest utility.

In the lower hills and foot hills erosion is prevented by the dense growth of bamboos or inferior species of trees and shrubs with which the clearings are quickly covered. The shifting character of the cultivation in these tracts is due not to any loss of fertility from the soil but to the fact that the ordinary *taungya* cutter has neither the capital or the labour at his disposal which would enable him to cope with this growth. In these areas the interests of the cultivators and the Forest Department conflict, and the question for decision appears to be in each case whether Government should take the certain profit, which can be calculated more or less accurately now, from the development of the area as a forest estate or should leave them open to the people in which case their profitable development under permanent agriculture must await the growth of an adequate population with sufficient capital.

Viewed thus the problem appears to be one for the administrator or the economist to resolve rather than for the agricultural expert.

Chemistry.

25. The work of the Chemical branch of the Department presided over with energy and enthusiasm by Mr. F. J. Warth, M.Sc., Agricultural Chemist, has developed greatly and it would appear that it is to this branch that we must look for a satisfactory solution of some of the most important problems connected with rice cultivation. Preliminary experiments conducted during the past two years go to show that the effect of the character of the soil is probably all important in the production of good yields. Pure line bred seed is not necessarily a good yielder unless the soil be suitable, nor does the land which produces the richest crop for the market necessarily produce the best seed grain. Again the problem of the breakage of rice grains during milling, the most serious difficulty at present confronting the milling industry, is almost entirely a chemical question.

Mr. Warth is engaged on the study of all these problems and his work will be further increased in the near future by the addition of those which the district agriculturists on their appointment to their districts may be expected to bring to light.

The result is that the Chemical branch is overweighted and it has been necessary to ask for an increase of two in the number of his assistants. Unlike the experimental farms where much of the work can be delegated to overseers and sub-overseers working under supervision, the Chemical branch must depend

on skilled assistants for the successful carrying out of the experiments initiated by it. The number of assistants required is therefore proportionately larger.

The following list, which does not include analyses carried out in connection with special enquiries, summarises the general analytical work carried out during the year:—

Soil analyses	26
Manures	21
Fodders	6
Rice	184
Miscellaneous	13
Total ...	250

The work done in connection with rice includes the following:—

(*a*) *Pot experiments.*—During the year 189 pot trials were completed. Soils and manures were prepared for 360 pots for the present season and a pure line culture of rice grown for the work.

(*b*) *Plot experiments.*—Preparations have been made for more extensive work on rice varieties and manuring. Seed has been collected, examined and grown.

(*c*) *Rice cultivation in various important tracts.*—Last year's work has been continued and some new varieties introduced into the scheme.

An examination of the typical rice soils employed in the plot and field experiments has been carried out.

The following papers were prepared and submitted for publication:—

(*a*) The disintegration of rice grains by means of Alkali.
(*b*) The chemical composition of rice mill products.
(*c*) The fractional liquefaction of rice starch.

Botany.

26. The survey of the peas and beans of the Province was completed during the year. Mr. Sawyer also co-operated with Mr. Thompstone in practical and botanical work on peas and beans at the Natywagon plot and in the preparation of pot cultures of *pegya* beans at Mandalay. He also assisted Mr. McKerral in experiments with sesamum, maize and Cambodia cotton at Tatkon.

A catalogue of the rice plant varieties of Upper Burma is under preparation and two cultivators' leaflets and two bulletins were also completed. A list of the commoner edible fungi was prepared during the year, and 112 mounted sheets showing specimens of plants of economic value and botanical interest were added to the herbarium. A complete collection chiefly of the fruits and seeds, together with herbarium specimens, in duplicate was made of the crops of one of the islands adjoining Mandalay and notes taken descriptive of their usual method of cultivation.

Mr. Sawyer also gave much useful advice on botanical references during the year.

Entomology.

27. Experiments in eri-culture were made by Mr. Shroff at Sagaing at the request of the Deputy Commissioner. They were unsuccessful, the climate being, as was anticipated, unsuitable for the purpose. The investigation of the life history of the mango-weevil was continued and should be completed in the coming year. Three pests of rice received much attention, namely *Spodoptera Mauritia*, Boisd, the swarming paddy caterpillar; *Nymphula depunctalis*, Guen, the paddy case worm and *Schoenobius bipunctifer*, Wlk, the paddy stalk-borer which is supposed to be responsible for the condition of rice plants known as "gwabo."

Collections of economic and other insects were made during the rains and a good deal of classification work was done.

The gold mohur tress on the Mandalay station suffered greatly from the attacks of swarms of chafer beetles, from the eggs of which are hatched the destructive chafer grub (*podigaung*). Several remedies were applied but without success until light traps were employed. By means of a Medusa lamp 17,000 insects were captured in six days, as many as 6,000 being taken on one occasion. More Medusa lamps have been ordered and it is hoped by their means to keep the pest under control next year. Many enquiries were received and much advice was given by Mr. Shroff during the year. A bulletin on the cotton pests of Burma was also issued.

Mycology.

28. Dr. E. J. Butler, Imperial Mycologist, visited Burma in November and December to study the condition of rice plants known as "gwabo." The result of his investigations was to show that the condition is not due to any one cause. In Lower Burma it appears to be chiefly caused by insects, probably the *Schoenobius bipunctifer*, but in Upper Burma an interesting form of it was found caused by a fungus, the *Sclerotium Oryzae*. Catt. Two other fungi were met with by Dr. Butler during his visit, *Tilletia horrida*. Tak. and *Ustilaginoidea virens* (cke) Tak.

The results of Dr. Butler's enquiries will be published as a bulletin of the Agricultural Research Institute, Pusa.

CHAPTER IV.

DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

Demonstration, Aid to the Public.

29. For effective demonstration work the Department must wait for the development of a staff of district agriculturists. In the mean time the Mandalay Station continues to be visited by agriculturists in increasing numbers. The Karen American Baptist Conference at Nyaunglebin was made the occasion of a small exibit of implements and arrangements are being made to maintain one permanently at the headquarters of the mission. An exhibit arranged at the Myittha pagoda festival in Kyaukse aroused much interest and it may be possible to make a more extended use of such local celebrations for the popularisation of the implements recommended by the Department. The store at Mandalay supplied more implements to the public than in the previous year. A list of these is printed as an appendix to this report.

Shows.

30. The Bhamo Agricultural and Live-stock Show was held as usual in March. The produce classes again contained good exhibits. A grant of Rs. 600 was made to the Show of the Agri-Horticultural Society of Burma held in Rangoon but no departmental exhibit was arranged.

General progress.

31. The progress of the Agricultural Department continues to be encouraging. The lines of experiment have been in many cases settled and Co-operative Societies are every year providing a better medium for the popularisation of the results attained. Organisation of the agriculturists of the Province is the condition precedent for the successful carrying out of any departmental propaganda among them. It is eminently satisfactory therefore as new crops are introduced and better and purer varieties of seed are produced by the Department or the utility of improved implements is demonstrated to find bodies of organised cultivators coming forward ready to take immediate advantage of them. I trust that the close relation between the Agricultural and Co-operative Departments now existing may long continue, for upon it in my opinion depends the future of agricultural progress in the Province.

CHAPTER V.

AGRICULTURAL ENGINEERING.

Nil.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Publications.

32. During the year the following cultivators' leaflets were issued—

No.	Subject.	Author.	Language.
1	2	3	4
38	Anthrænose (a disease of the cotton-pest).	Mr. A. M. Sawyer ...	English.
39	Dry weather cultivation of Burmese vegetables on paddy soils.	Mr. A. McKerral, M.A., B.Sc.	English and Burmese.
40	Winnowing Machines ...	Mr. E. Thompstone, B.Sc. ...	English and Burmese.
41	Chain Pumps ...	Mr. E. Thompstone, B.Sc. ...	English and Burmese.
42	Anti-Rinderpest Serum ...	... ..	English and Burmese.

The following publications were also completed during the year—

BULLETINS.

No. 8—Cotton-pests in Burma by K. D. Shroff, B.A., Assistant Entomologist.
No. 9—Cultivation of the Grape vine by A. M. Sawyer.

MISCELLANEOUS.

The Burma Agricultural Calendar for 1913-14 issued in Burmese. It appears to have been well received.

Supply of information.

33. The increase in the number of applications for information received both in my office and by the various agricultural experts is very gratifying. Every year more Burmans actually engaged in agriculture are learning to refer their problems to the Department, and to follow its advice when given. Numerous enquiries have also been received from Rangoon firms and it is clear that the Department is growing in popularity both with the cultivating classes and with the merchants of Rangoon.

CHAPTER VII.

MISCELLANEOUS.

Poultry breeding.

34. Poultry breeding on the Mandalay Farm has been carried on under considerable disadvantages. Thefts have been frequent and over Rs. 200 worth of stock has thus been lost to the Department. The runs have now been moved to a more protected site. These thefts though annoying testify to the value placed upon the improved strains in the neighbourhood.

Departmental Conferences.

35. Departmental Conferences are now held regularly every six months and have proved of great value in co-ordinating the work of the various officers of the Department and also in giving opportunities for discussions on agricultural affairs. The proceedings are printed and circulated to Commissioners and District Officers.

Conclusion.

36. The work of the staff throughout the year has been excellent and I desire to record my appreciation of it. The best thanks of the Department are due to all District and Settlement Officers and also to the Burma Chamber of Commerce for the keen interest shown by them in the work of the year and their willingness to co-operate in the agricultural development of the Province.

H. CLAYTON,
Offg. Director of Agriculture, Burma.

APPENDICES.

PAGE

APPENDIX I.—Statement of receipts and expenditure for experimental cultivation during 1912-13. 15

APPENDIX II.—Administration Reports of the Agricultural Stations, Mandalay and Hmawbi, for 1912-13. 16—23

APPENDIX III.—List of Implements sold from the Implement Depôt, Mandalay Agricultural Station. 24

APPENDIX I.

Receipts and expenditure for experimental cultivation during the year 1912-13, exclusive of the Agricultural Stations at Mandalay and Hmawbi.

No.	Stations.	Budget allotment.	Receipts from the sale of produce.	Expenditure.							
				Establishment.	Wages of Farm and maistries and coolies.	Feed and upkeep of stock.	Purchase of seed and fruit trees.	Upkeep of gardens, fencing and trenching.	Purchase of live stock and agricultural implements.	Miscellaneous contingencies.	Total.
1	2	3	4	5	6	7	8	9	10	11	12
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Bhamo (Sinlumkaba).	1,250	135	900	...	...	60	...	...	7	967
2	Chin Hills (Falam and Tiddim).	1,378	217	708	...	...	113	...	...	101	922
3	Myitkyina ...	1,393	84	918	...	...	56	281	...	23	1,278
4	Southern Shan States, (Taunggyi).	3,768	581	2,938	...	32	3	...	52	37	3,062
5	Distribution of seed from headquarters.	2,800	...	...	...	...	...	...	2,398	...	2,398
6	Distribution of Agricultural Implements.	...	...	...	...	...	...	...	...	...	...
7	Sericulture ...	500	...	...	...	...	...	...	...	...	...
	Total ...	11,089	1,017	5,464	...	32	232	281	2,450	168	8,627

APPENDIX II.

ADMINISTRATION REPORT OF THE MANDALAY AGRICULTURAL STATION.

1. *General.*—This station is now in good working order, the whole area (430 acres) with the exception of about 60 acres occupied by buildings, compounds, roads, poultry and grazing-ground, being under permanent cultivation. There still remain many permanent improvements to be carried out but these will be effected gradually as time and funds permit. A larger area has been brought under experiment and a very considerable area is now devoted almost entirely to 'Line-breeding', seed-selection and seed multiplication. The late rains of last year almost entirely failed and as a consequence cold weather crops were of little value. Otherwise the season was a fairly good one and crops were satisfactory. Irrigated crops were very good. The new granary enabled us to wait for a rise in the market before disposing of our own produce and consequently good prices were realised.

The Natywagôn area is regarded as a part of the Mandalay station. On it those crops chiefly pulses, for which the soil of the station proper is too heavy or otherwise unsuitable are experimented with and selected. *Pebyugyi* trials and Dry Zone crop selections are the principal work of these plots.

Another sub-station has also been started for the investigation of special problems at Bugyi. The recurring expenditure from this will also be met from the Mandalay station.

2. *Staff.*—A number of changes have taken place and the establishment has not been at its full strength, though the work has suffered less on this account than in previous years.

Maung Ba Thein, Sub-overseer, was promoted to the temporary post of lecturer on 1st June 1912, and his place was left vacant till 1st April 1913, when he reverted. Maung Tha Dun was on leave from June 3rd, 1912, and returned to duty on 1st April 1913. His place from June 1912 to February 1913 was also unfilled, and on March 1st the post was filled up by Maung Tin II, Probationer, who reverted at the end of the month. On 1st April 1913 Maung Maung Gyi's services were transferred to the office of Agricultural Chemist. Maung San who acted for Maung Maung Gyi also reverted to his permanent post in Director of Agriculture's Office on 15th April, and in his place Maung Tu, a private student of the year's agricultural class, was selected and appointed.

3. *Houses.*—Members of the staff were well housed but the sites of their houses are somewhat low as is also that of the Farm buildings. After heavy showers of rain water remains round the buildings for days. With the object of draining this area, a contract for the construction of a small culvert under the Patheingyi tributary was given, but the work has been delayed on account of the opening of the canal and because of the delay in completing the new Mandalay drain.

Permanent quarters for a few of the coolies are badly needed for reasons given in former years. Some of the coolies have erected their own huts of bamboos and palm leaves, but they are far from healthy. We had six deaths (chiefly attributed to Malaria) among the resident coolies during the busiest season. This caused a panic among some of the remaining ones and many left for their native places. Considerable difficulty was experienced in getting substitutes.

4. *Water-supply.*—Considerable progress has been made by the Public Works Department with this important work and we expect to have a permanent supply before long thus saving the heavy expenses of so much water carting.

5. *Labour.*—Labour is still expensive and good permanent men are difficult to obtain especially without accommodation for housing. As already stated above a number of deaths at a busy season increased the difficulty.

6. *Cattle.*—Four bullocks died during the year, the cause of death in each case as reported by the Veterinary Assistant being old age. Owing to an accident a fifth one is at present unfit for work. We have had no infectious disease of any kind. Two young pairs of bullocks were bought to replace those which died. The cattle are now in good condition.

Fodder and Foods were plentiful and there was a large surplus of paddy straw which sold well—partly chaffed for cattle food and partly as rough straw for litter.

7. *Manures.*—The stable manure has, as before, been procured from Mandalay Municipality; 150 lbs. of sulphate of potash and 200 lbs. of precip. bone phosphate were bought from Messrs. F. O. Blœch & Co. of Rangoon and their manurial value will be tested in the coming year. The manure tanks remain as before the waste from lack of good storage pits being very great. The new ones, put into the hands of the Public Works Department two years ago, have not yet been begun.

8. *Implements and Machinery.*—The Implement Depôt scheme started last year has relieved the farm of a considerable amount of expenditure and at the same time simplified the problem of the supply of approved implements to cultivators. The first expenditure under this head, for which we have a circulating grant of Rs. 5,000 from Government, was

incurred in November 1912, and the first balance sheet up to March 31st, 1913 (five months) is given below.

The demand among cultivators was principally for "Gwinsets", winnowers, chainpumps, hand chaff-cutters and Beeloo ploughs. A number of new implements have been tried, but few have succeeded in passing the test. The "New Cyprus" plough does specially good work and was well received by cultivators who tried it. Two other ploughs have also been found satisfactory for special purposes and may be introduced.

A small bullock thresher was obtained for trial on account of the many enquiries which have been made for these machines. As a paddy thresher it does not work very satisfactorily, but with a little alteration ought to do so.

The large thresher and winnowers do very good work and save much labour, especially in threshing and cleaning grain for seed purposes.

All implements distributed are fitted up for the purchaser and, where necessary, as in the case of chain pumps, winnowers and similar implements, demonstrations are given on the spot.

9. *Seeds and produce.*—The produce has again increased and the work on seed selection, production and distribution has expanded. Many Co-operative Credit Societies were supplied with selected seed for distribution to members. Still better selections are in process of multiplication on the farm for future distribution. Receipts from sales of produce amount to Rs. 6,509-10-0. Seeds were distributed free to the value of Rs. 160-9-9. The value of produce on hand amounts to Rs. 2,616-1-0.

10. *Accounts.*—Attached is a statement of receipts, expenditure and produce in hand on July 1st, 1913. Also the balance sheet of the Central Implement Depôt up to March 31st, 1913. The receipts from sales of produce show a decrease of Rs. 343, but there is a sum of Rs. 2,170 outstanding for seed paddy supplied to Co-operative Credit Societies. Hence there is really an increase over last year's receipts of more than Rs. 1,800. Moreover, there is an increase of Rs. 489-7-0 on produce in hand. The Implement Depôt has very considerably reduced the number of sales of implements on account of the farm—the receipts being Rs. 580-4-0 as compared with Rs. 1,213-6-0 during the year 1911-12.

Statement showing receipts of the Agricultural Station, Mandatay, for the year ended 30th June 1913.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SALE OF FARM PRODUCE.		
Paddy	5,949 10 0	
Gram	40 0 0	
Cotton	21 2 0	
Wheat	54 5 0	
Linseed	47 14 6	
Castor seeds	1 7 3	
Pyaeng seeds	2 0 0	
Pyaung or Jowar stalk	74 13 6	
Paddy straw	318 5 9	
		6,509 10 0
Value of Implements distributed :—		
Sale of Implements	580 4 0	
Implements Book Transfer through the Director of Agriculture	8 0 0	
		588 4 0
Value of seed distributed :—		
Seed distributed free	160 9 9	
Seed sold to Co-operative Credit Societies—not yet paid for ...	2,170 0 0	
		2,330 9 9
Hire of winnowing machine	37 0 0	
Hire of Farm carts	30 15 0	
		67 15 0
		9,496 6 9
Value of produce on hand :—		
Paddy	747 12 0	
Wheat	29 8 0	
Gram	78 4 0	
Cotton	47 0 0	
Linseed	56 13 0	
Sunn Hemp	39 9 0	
Jute	25 6 6	
Oat	110 8 0	
Pyaung seed	101 4 6	
Paddy straw	500 0 0	
Pyaung or Jowar stalk	800 0 0	
Miscellaneous	80 0 0	
		2,616 1 0
GRAND TOTAL ...	.....	12,112 7 9

Statement showing the expenditure of the Agricultural Station, Mandalay, and Natywagôn, for the year ended 30th June 1913.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SUPPLIES AND SERVICES.		
* Wages of Farm maistries and coolies	9,893 13 2	
Feed and upkeep of stock	1,179 6 6	
Purchase of seed and fruit trees	277 13 3	
Upkeep of garden, fencing and trenching	1,287 4 11	
Purchase of live-stock and agricultural implements	2,222 9 11	
Petty construction and repairs of work	1,300 0 0	16,160 15 9
Contingencies :—		
Service postage and telegram charges	25 3 6	
Purchase of furniture	69 4 0	
Freight, shipping, and landing charges	389 11 0	
Purchase of books and periodicals	.....	
Office expenses and miscellaneous	1,195 2 8	
		1,679 5 2
		17,840 4 11
* Includes labour expended for Agricultural Chemist	290 0 0	
Includes labour expended for Assistant Botanist	256 0 0	
Includes labour expended for Assistant Entomologist ..	15 0 0	561 [illegible]
GRAND TOTAL ...	.....	7,79 4 11

Implement Depôt Balance Sheet.

Date.	Expenditure.	Rs. A. P.	Rs. A. P.	Date.	Receipts.	Rs. A. P.	Rs. A. P.
7th November 1912.	Drawn from the Treasury on Voucher No. 185.	220 0 0		10th December 1912	Credited into Treasury, *vide* Chalan No. 2.	230 0 0	
11th November 1912.	Drawn from the Treasury on Voucher No. 271.	408 5 0		24th January 1913.	Credited into Treasury, *vide* Chalan No. 4.	150 0 0	
11th November 1912.	Drawn from the Treasury on Voucher No. 271.	227 2 0		17th March 1913.	Credited into Treasury, *vide* Chalan No. 19.	250 0 0	
30th November 1912.	Drawn from the Treasury on Voucher No. 489.	220 0 0		19th March 1913.	Credited into Treasury *vide* Chalan No. 21.	28 0 0	
11th December 1912.	Drawn from the Treasury on Voucher No. 264.	1,523 5 0		26th March 1913.	Credited into Treasury, *vide* Chalan No. 51.	120 0 0	
7th January 1913.	Drawn from the Treasury on Voucher No. 422.	66 0 0			Total ...	...	778 0 0
24th January 1913.	Drawn from the Treasury on Voucher No. 731.	865 0 0			Implements sold for which cash has not yet been received (Chiefly to Co-operative Credit Societies).	1,331 8 0	...
24th January 1913.	Drawn from the Treasury on Voucher No. 785.	62 10 0					
6th February 1913.	Drawn from the Treasury on Voucher No. 897.	300 0 0			Total ...	...	1,331 8 0
	Total ...	...	3,892 6 0		Value of Implements on hand.†	...	1,904 12 8
	Balance (being excess of receipts over expenditure)*	...	121 14 8		GRAND TOTAL ...	...	4,014 4 8

* The selling price exceeds the cost price by a small percentage calculated to cover cost of handling.

† Calculated at cost price only. List attached.

Implement Depôt Stock on 31st March 1913.

Item.	Implement.	No.	Value (Purchasing price). Rs. A. P.	Remarks.
1	Chaff Cutters	None	...	
2	"Beeloo" Plough No. 1	2	42 8 0	
3	Shares for above	43	40 5 0	
4	"Beeloo" Plough No. 2	2	52 4 8	
5	Shares for above	2	2 8 0	
6	"Beeloo" Plough No. 3	1	30 14 0	
7	Shares for above	3	5 5 0	
8	Winnowers No. I	1	115 0 0	
9	Winnowers No. II	1	140 0 0	
10	Winnowers No. III	1	185 0 0	
11	Winnowers No. IV	1	205 0 0	
12	Winnowers No. V	2	580 0 0	
13	Chain pumps	None	...	
14	*Gwinsets*	23	506 0 0	
	Total ...	...	1,904 12 8	

ADMINISTRATION REPORT OF THE HMAWBI AGRICULTURAL STATION FOR THE YEAR 1912-13.

1. *General.*—The area under cultivation during the year was about 75 acres including roads, bunds, and water-channels. It was not deemed advisable to extend the area further until the buildings had been erected. These have been estimated for at a cost of Rs. 65,000 and the work is to be put in hand shortly.

Owing to the remoteness of the land originally chosen for the building site and to its somewhat uneven character a new site of about 11 acres has been chosen opposite to the land under cultivation at present.

During the year nine pairs of working bullocks were purchased at Allanmyo at a total cost of Rs. 1,,35.

To house these temporarily a bamboo shed has been erected on the building site and several other small sheds for the storage of seed manure have also been constructed.

2. *Varietal work and selection with paddy.*—About 200 different kinds of paddy received from the districts were grown in rows last season and notes made on the appearance of the seed, growth period, etc. Many of these were found to be mixtures and at harvest the components of each varieties were separated out and a single-ear selection made from each.

A primary classification into eight groups was made according to the nature of the grain (glûtinous or non-glutinous) and with reference to its shape and colour.

These cultures amount now to over 300 and are being grown during the present year. At harvest this year the above eight classes will have to be further subdivided into early, medium, and late varieties and finally detailed descriptions made of each variety with regard to stem character, habit of growth, etc. That being done selection will be made of those varieties which appear most suited to the Rangoon rice trade on the one hand and to cultivator's needs on the other and these will finally have to be tested against each other for yield and other practical characters.

A number of varieties were obtained last year from Japan, Java and Siam and tested on the station.

With the exception of one Java variety which is undergoing selection this year all of these were found unsuited to Burma demands.

3. *Intra-varietal selection.*—This constitutes the most important work of the station. In the absence of the general information regarding Burma rice varieties which the above work (in section 2) is meant to furnish recourse was had to half a dozen varieties which had already an established reputation among millers and cultivators and, using the single-ear culture method, an attempt is being made to purify them of coloured grain and at the same time perform selection for yield by keeping as a future stock for propagation and distribution the progeny of the best yielding ears.

The varieties chosen were—

Ngaseingyi.	Bawyut-Midon.
Ngaseindumè.	Ngachima.
Letywezin.	Soerabaya (a Java variety).

Selection was made of the best among 1,000 plants of each of those varieties, 100 seed present plants being finally chosen from each variety. The test is being made during the present season and a full report of the result will be published when the work has been completed. This work is very heavy and demands the greatest care and attention from all engaged in it. The cultures will cover about 6 acres.

4. *Manurial Experiment.*—A scheme of manurial experiment was devised during the year and the work is being begun during the present planting season. The object of the experiment is to test the effect of manure applied to the transplanting fields, instead of, as in Burmese practice, applied to the nurseries only. In this connection the effect of applying various doses of cattle manure and oil-cakes alone and in combination with various artificial manures, and the effects of applying various artificials alone, are being compared and contrasted. The experiment, which will have to last several years to give reliable results, is being carried out on 17 of the 80 small plots constructed for that purpose last year. Each plot measures ·09 of an acre.

The yields of these plots unmanured were taken during the season of 1912 and appeared too irregular to admit of a reliable result being got in one year. This, however, was largely due to the fact that the bunds were new.

From these yields (of the 80 plots) the correlation of straw and grain weight for paddy was studied and found to be very high, the co-efficient of correlation being ·8. This seems to indicate that it will be sufficient in future to take total plant yield only, instead of separately weighing grain and straw. A great saving in time would thereby be effected. A further test of this relation will be made during the present season.

5. *Spacing Experiment.*—An important point in paddy cultivation is the distance apart at which transplant should be put down and the number of plants per hole. To test this plants of *Ngasein* as even in size as possible were planted out in rows at 6 inches, 12 inches and 18 inches apart. In each case planting was done with 1, 2, 3 and 4 plants, giving altogether twelve different ways of planting. So far as the result of one year's experiment shows it appears that the yield falls off in all cases when the distance of 6 inches is exceeded. The highest yield was got planting at 6 inches apart and using three plants to the hole. I am not satisfied, however, with the result of the experiment and am inclined to think that the variety used and the fertility of the soil should determine the method of planting. Accordingly the experiment will be remodelled during the present year.

6. *Cross-fertilization Experiment.*—This term means the transference of the pollen of one variety on to the flower of another resulting in the production of a hybrid plant. The subject is of the greatest importance for the following reasons: (1) In performing selection cultivators are as a general rule unable to detect and eliminate hybrids. For example, in the important case of red grain contamination when a white paddy is crossed by a red, no trace of the crossing appears in the first year, the crossed grains remain white during that year and is passed as white by the cultivator. Next year, however, it produces a plant in which all the grains are red. (2) On the Experimental Station the facility with which such crossing occurs must be known in order that such arrangement may be made as will keep selected cultures pure. (3) While the above two reasons may be described as detrimental, the existence of first-year hybrids in cultivators' crops constitute a valuable source of material to the plant-breeder once he has detected them. The reason for this is that crossing leads to variation and the production of a large number of new types in the progeny of the hybrid and one of these types may prove to be superior to either of the present forms.

The question was studied at Hmawbi during the season of 1912 by using the character of redness in the grain as an index; and by observing the number of white plants arising from a known number of red sowings and *vice versâ*. So far as the work done shows crossing is small and I estimate it for the particular case studied at between one and one-tenth per cent. of the whole crop. This result shows that cultivators themselves, by want of care in selecting out the visibly red-grain are often most to blame for the contamination that exists.

The fact that natural crossing does occur, however, shows that the production of absolutely pure red-free grain is work that can only be done on the Experimental Stations. There is also a possibility that the occurrence of natural hybrids may be greater in some localities than others and this year I am repeating the test with samples of seed obtained from Ma-ubin and Tavoy.

The detailed results will be made known when a sufficient amount of evidence has been collected.

7. *Staff, etc.*—The administration of the station was under my control during the year. Maung Ba I acted as overseer, and Maung Po Than and Maung Ba II, as sub-overseers. Maung Po Than was subsequently transferred to Tatkon to supervise the Cambodia cotton experiment and on the completion of that work went to Pwinbyu to take charge of the new Experimental Station there. In April six District Agriculturists were transferred to the station from Mandalay and are at present undergoing a training in the methods of paddy selection described above.

The work and conduct of all the Subordinate Staff were quite satisfactory during the year.

The presence, however, of a Superintendent of the farm is much to be desired.

8. *Expenditure and Receipts.*—The following table gives the expenditure incurred and the receipts from paddy sales during the year ending 30th June 1913.

Statement showing expenditure of the Agricultural Station, Hmawbi, for the year ended 30th June 1913.

A.—EXPENDITURE.

—	Amount.	Total.
1	2	3
SUPPLIES AND SERVICES.	Rs. A. P.	Rs. A. P.
Wages of Farm maistries and coolies	5,106 1 1	
Feed and upkeep of stock	24 1 0	
Purchase of seed and fruit trees	91 8 0	
Upkeep of garden, fencing and trenching	78 10 0	
Purchase of live-stock and Agriculture Implements	3,211 4 11	
Acquisition of the land for building site	1,244 0 0	9,735 9 0
CONTINGENCIES.		
Service, postage and telegram charges	...	
Purchase of furniture	50 3 4	
Freight, shipping, and landing charges	56 14 0	
Purchase of books and periodicals	...	
Office expenses and miscellaneous	212 10 3	
Rent, rates and taxes	65 8 0	384 15 7
Grand Total ...	...	10,140 8 7

B.—RECEIPTS.

The sum of Rs. 4,379-13-6 was obtained from sales of paddy during the year.

A. McKERRAL,

INSEIN, *4th August 1913.* *Deputy Director of Agriculture, Southern Circle.*

APPENDIX III.

List of Implements sold from Implement Depôt, Mandalay Agricultural Station.

Serial No.	Name of Implements.	District.	Number distributed.		Total.	Value.		
			Society.	Individual.				
1	2	3	4	5	6	7		
						Rs.	A.	P.
1	Raja Chaff Cutter	Mandalay ...	...	1	1	46	0	0
2	Raja Chaff Cutter	Mandalay ...	...	1	1	46	0	0
3	Raja Chaff Cutter	Mandalay ...	...	1	1	46	0	0
4	Raja Chaff Cutter	Mandalay ...	...	1	1	46	0	0
5	Raja Chaff Cutter	Ma-ubin ...	...	1	1	46	0	0
6	Raja Chaff Cutter	Mandalay ...	...	1	1	46	0	0
7	Winnowing machine	Insein ...	...	1	1	150	0	0
8	Winnowing machine	Mandalay ...	...	1	1	125	0	0
9	Winnowing machine	Mandalay ...	...	1	1	125	0	0
10	Winnowing machine	Mandalay ...	...	1	1	120	0	0
11	Winnowing machine	Shwebo ...	1	...	1	220	0	0
12	Winnowing machine	Shwebo ...	1	...	1	125	0	0
13	Winnowing machine	Shwebo ...	1	...	1	125	0	0
14	Winnowing machine	Mandalay ...	...	1	1	125	0	0
15	"Beeloo" plough and shares	Rangoon ...	...	1	1	28	0	0
16	"Beeloo" plough and shares ...	Rangoon ...	...	1	1	27	0	0
17	"Beeloo" plough and shares ...	Sagaing ...	...	1	1	197	8	0
18	"Beeloo" plough and shares ...	Mandalay ...	...	1	1	27	0	0
19	*Gwinset* or grass cutting *htun* ...	Kyauksè ...	...	1	1	26	8	0
20	*Gwinset* or grass cutting *htun* ...	Kyauksè ...	...	1	1	26	8	0
21	*Gwinset* or grass cutting *htun* ...	Kyauksè ...	...	1	1	26	8	0
22	*Gwinset* or grass cutting *htun* ...	Kyauksè ...	...	1	1	26	8	0
23	*Gwinsets* and extra teeth	Shwebo ...	...	1	1	29	8	0
24	*Gwinsets*	Kyauksè ...	...	1	1	26	8	0
25	*Gwinsets*	Kyauksè ...	...	1	1	26	8	0
26	*Gwinsets*	Kyauksè ...	...	1	1	26	8	0
27	Chain pump	Yamèthin ...	...	1	1	65	0	0
28	Chain pump with gear	Kyauksè ...	...	1	1	300	0	0
29	Bullock gear	Mandalay ...	...	1	1	126	0	0
	Total ...	...	...	...	...	2,376	8	0

G. B. C. P. O.—No. 43, D. of A., 31-10-1913—517—A. D. C

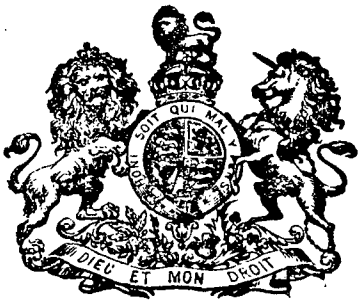
REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ended the 30th June 1914



RANGOON

OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, BURMA

1914

LIST OF AGENTS

FOR THE

SALE OF GOVERNMENT PUBLICATIONS.

IN INDIA:

THACKER, SPINK & Co., Calcutta and Simla.
W. NEWMAN & Co., Calcutta.
THACKER & Co., Ltd., Bombay.
HIGGINBOTHAM & Co., Madras.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
* D. B. TARAPOREVALA & SONS & Co., 103, Medows Street, Fort, Bombay.
BUTTERWORTH & Co. (India), Ltd., 8-2, Hastings Street, Calcutta.

IN ENGLAND:

HENRY S. KING & Co., 65, Cornhill, E.C.
A. CONSTABLE & Co., 10, Orange Street, Leicester Square, W.C.
KEGAN PAUL, TRENCH, TRÜBNER & Co., 68—74, Carter Lane, E.C.
BERNARD QUARITCH, 11, Grafton Street, New Bond Street, W.
P. S. KING & SON, 2 & 4, Great Smith Street, Westminster, S.W.
GRINDLAY & Co., 54, Parliament Street, S.W.
T. FISHER UNWIN, 1, Adelphi Terrace, W.C.
W. THACKER & Co., 2, Creed Lane, Ludgate Hill, E.C.
LUZAC & Co., 46, Great Russell Street, London, W.C.
OLIVER & BOYD, Tweeddale Court, Edinburgh.
E. PONSONBY, Ltd., 116, Grafton Street, Dublin.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
DEIGHTON, BELL & Co., Trinity Street, Cambridge.

ON THE CONTINENT:

ERNEST LEROUX, 28, Rue Bonaparte, Paris, France.
MARTINUS NIJHOFF, The Hague, Holland.

* For the sale of official publications excluding those of the Legislative Department of the Government of Burma.

[The maximum limit of the body of the Report is 12 pages.]

TABLE OF CONTENTS.

REPORT ON THE OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA, FOR THE YEAR ENDED THE 30TH JUNE 1914.

CHAPTER I.—ADMINISTRATION.

PARA.		PAGE
1.	Personal	1
2.	Tours	*ib.*
3.	Staff	*ib.*

CHAPTER II.—AGRICULTURAL EDUCATION.

4.	Agricultural Education	1 & 2
5.	School Gardens	2

CHAPTER III.—AGRICULTURAL RESEARCH AND EXPERIMENT.

6.	The Deputy Director, Northern Circle	2 & 3
7.	The Deputy Director, Southern Circle	3
8.	Agricultural Stations	3 & 4
9.	Experimental Gardens	4
10.	Financial aspect	*ib.*
11	Experiments through district agency	4 & 5
12.	Cotton	5
13.	Co-operative ginneries	5 & 6
14.	Possibility of tube well irrigation for cotton	6
15.	Wheat	*ib.*
16.	Castor	7
17.	Jatropha Curcas	*ib.*
18.	Madagascar beans	*ib.*
19.	Sugarcane	*ib.*
20.	Miscellaneous	*ib.*
21.	Chemistry	7 & 8
22.	Dairying	8
23.	Botany	*ib.*
24.	Entomology	8 & 9

CHAPTER IV.—DEMONSTRATION, ETC.

25 & 26	Demonstration—Aid to the Public	9
27.	Shows	10
28.	General Progress	*ib.*

CHAPTER V.—AGRICULTURAL ENGINEERING.

29.	...	10

CHAPTER VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

30.	Publications	11
31.	Supply of information	*ib.*

CHAPTER VII.—MISCELLANEOUS.

32.	Poultry breeding	11
33.	Departmental Conferences	*ib.*
34.	Conclusion	12

From P. C. FOGARTY, Esq., I.C.S., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 288—5R.-74 of the 17th November 1914.

I am directed to submit in proof three copies of the Report by the Director of Agriculture on the operations of the Department of Agriculture, Burma, for the year ending the 30th of June 1914.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE BURMA

For the year ended the 30th June 1914.

CHAPTER I.

ADMINISTRATION.

Personal.

1. Mr. J. MacKenna, I.C.S., Director of Agriculture, remained on deputation as officiating Agricultural Adviser to the Government of India until the 23rd February 1914 when he was appointed to be Deputy Commissioner, Amherst District. I officiated for him during his absence and succeeded him in the appointment.

Mr. J. A. Stewart, I.C.S., was placed on special duty in the Director's office from the 24th June 1914.

Tours.

2. During the year 195 days were spent on tour. The following districts were visited: Toungoo, Insein, Pegu, Prome, Henzada, Tharrawaddy, Bassein, Myaungmya, Kyaukse, Sagaing, Mandalay, Shwebo, Meiktila, Yamèthin, Bhamo, Rangoon Town and the Southern Shan States.

I also attended the meeting of the Board of Agriculture held at Coimbatore from the 9th to the 13th December 1913.

Staff.

3. The superior staff of the department remained unchanged throughout the year. Two new appointments were made to the subordinate staff, Mr. Beale taking up the post of Assistant Botanist, Southern Circle, at the conclusion of his two years' training in Poona, and Maung Tin, a passed student of the Cirencester Agricultural College, being posted as Superintendent of the new station at Tatkon.

A temporary Superintendent for the Hmawbi farm has also been sanctioned for one year pending the completion of the training of one of the new probationary assistants. The recruitment of five probationary assistants of whom two are destined for Superintendents of farms and three for the Agricultural Chemist's branch was also sanctioned. Mr. Darabsett, first assistant to the Agricultural Chemist, resigned his appointment towards the close of the year. An increase of five to the staff of district agriculturists was sanctioned and the men commenced their training on the 1st April 1914.

CHAPTER II.

AGRICULTURAL EDUCATION.

Agricultural Education.

4. As in former years the main work of the department in connection with agricultural education was confined to the training of junior members of the staff. The first batch of six district agriculturists completed their training and were posted to districts in April 1914. In the same month five additional district agriculturists were recruited and their training, together with that of the new probationary assistants, is now in progress.

A recurring grant of Rs. 1,500 was made available for agricultural education during the year. A temporary Supervisor of school gardens was appointed out of this grant for three months for service in the Kyauksè District. This officer has since April 1st been taken over by the district fund. Stipends were granted to members of Co-operative Societies who desired to gain experience of the methods in use on the experimental farms and an experimental dairy was opened at Mandalay.

The cost of the experimental dairy is since April 1st being met from other sources, and the whole of the recurring grant will be spent on stipends to co-operators working on the farms during the current financial year 1914-15.

School gardens.

5. The interest in school gardens spoken of in the last annual report has continued to grow, and the movement appears to be spreading rapidly in several districts of the province. It has been decided that the Education Department should remain in complete control of these gardens, but the department will be glad to supply English vegetable seeds in small quantities to any garden requiring them. Some special organization for the supervision of the movement appears to be required, but it is understood that this has not been lost sight of by the Educational authorities.

Mr. Thompstone's "Introduction to School Gardening" has now been published, both in English and Burmese, and is said to be proving of great utility.

CHAPTER III.

AGRICULTURAL RESEARCH AND EXPERIMENT.

The Deputy Director of Agriculture, Northern Circle (Mr. E. Thompstone).

6. Mr. E. Thompstone, B.Sc., Deputy Director of Agriculture, was in charge of the Northern Circle throughout the year. The most important work as in former years was carried out at the Mandalay Experimental station and its adjoining sub-station of Natywagôn.

Two new stations were opened during the year, one at Padu in the Sagaing District for the study of "durum" wheats and cotton, and near Hopin in the Myitkyina District for the study of bread wheats, the cultivation of which it is hoped to introduce into Northern Burma. Both stations are equipped with temporary buildings only and are run directly from Mandalay by means of the regular farm staff.

A poor season adversely affected the work at Mandalay on crops other than paddy. Experimental work on paddy included an economic classification, together with a permanent collection of the varieties of paddy grown in Upper Burma. Some 560 varieties were dealt with during the year. Manurial and transplanting experiments were also continued, the results obtained from the latter indicating that thinly-sown nurseries and the planting of double seedlings form the best procedure in Mandalay. Line breeding of pure varieties of paddy is also being dealt with successfully. A pure variety of *Kalagyi*, yielding about 12 per cent. more than the ordinary hand-selected *Kalagyi* is now being grown on the Mandalay seed production area and will be available next season for issue to the public. Several varieties of *Ngasein* on which work is still progressing in the breeding area promise even better results, one line having yielded last year as much as 27 per cent. above the ordinary cultivators' paddy of the same variety.

The work done at Mandalay on wheat has so far been confined to selection for seed purposes. The farms at Padu and Hopin will enable this crop to be taken up in earnest. There is likely to be a good market for the crop in Northern Burma if it can be established there, the Superintendent of Police Supplies having expressed his willingness to receive tenders from local cultivators as soon as his present contracts run out in 1915.

Peas and beans again commanded attention. Four pure lines of one type only of *Pegya* (Phaseolus lunatus, Linn.) have so far been obtained, a pure red variety, and experiments are being continued. Madagascar beans were again experimented with at Natywagôn and also on the stiff soil of the Mandalay farm. Specimens

of last year's crop sent to the Imperial Institute showed a distinct increase in the amount of prussic acid present, as compared with the seed originally imported. The total amount present however remains insignificant. There is also a tendency to a reduction in size. This was especially noticeable on the Mandalay farm soil, which is not generally suitable to the crop. The independent experiments with this crop made by some fifty co-operative societies as mentioned in last year's report were watched by the department and some useful information as to suitability of soils, times of sowing and the like obtained therefrom.

Two good strains of *Peseingon* (Cajanus indicus) (sprong) and one of gram, the latter yielding 15 per cent. above the ordinary variety, have been evolved and some seed has been distributed to the public. Work on *Sadawpe* (pisum sp.) will be taken up at Hopin, where this crop has probably a future before it in rotation with wheat. Sown among ripening paddy before harvest in the adjoining tract of Katha, it gave this year excellent outturns in some cases. The cultivation of the castor oil plant, a recent introduction into Upper Burma, also commanded attention. Mr. Thompstone toured through the Kyauksè and Sagaing Districts in connection with this crop and in view of its present mixed condition, efforts are being made to secure pure and superior strains by selection. A serious disease which causes the flower and fruits of the castor to shrivel and dry up was investigated and specimens were sent to Pusa. The disease is reported to be due to a species of Botrytis, a genus which, though a common parasite of garden plants in Europe, is comparatively rare in India. Lectures and demonstrations were arranged for the Myittha festival as in the preceding year, but were not given as the festival was abandoned owing to a plague epidemic. Mr. Thompstone was unfortunately incapacitated by an attack of enteric fever towards the close of 1913 and was thereby prevented from attending the meeting of the Board of Agriculture at Coimbatore in December. Luckily he made a rapid recovery and the work of his circle did not suffer. Had he been compelled to take leave the department would have experienced a serious set back as the charge of both circles is now much too heavy a task for a single Deputy Director. In view of the fact that he now proposes to take furlough in 1915, the need of an addition to the superior staff is becoming urgent.

The Deputy Director of Agriculture, Southern Circle (Mr. A. McKerral).

7. Mr. A. McKerral, B.Sc., Deputy Director of Agriculture, was in charge of the Southern Circle throughout the year. The erection of the recently sanctioned buildings for the Hmawbi farm has been in progress during the year, but I regret to say that the Public Works Department did not find it possible to complete them before the rains began. These buildings will greatly facilitate the carrying out of the experimental work in progress at Hmawbi, full details of which are given in the special administration report of this station.

The plant breeding and seed selection work carried out during the year is of considerable importance and the results are likely to prove of great value.

Outside Hmawbi the inception of work at the recently sanctioned dry zone station at Tatkôn occupied a good deal of Mr. McKerral's time. This farm consists of 40 acres, and has been equipped with mat and thatch buildings only. Experiments in connection with cotton, maize, castor and sesamum will be conducted here. The small station at Pwinbyu in the Môn canals area was cultivated with eight different varieties of paddy and two of cotton, and some useful information as to the relative qualities of various local strains has been obtained. A promising start was also made with Cambodia cotton, which is particularly suitable for irrigated areas. The increased staff, which, as already described, has now become available for the Southern Circle, will enable Mr. McKerral to do more outside work than has hitherto been possible. His charge is however far larger than any one man can satisfactorily undertake and, until an increase in the number of Deputy Directors can be sanctioned, a good deal of it must perforce remain unvisited and its problems neglected.

Agricultural stations.

8. The administration reports of the Hmawbi and Mandalay stations are printed as appendices to this report. It is not necessary therefore to notice them further here. These are

the only stations equipped with permanent buildings. Elsewhere at Tatkôn, Padu, Bugyi, Ywathitgyi and Pwinbyu the buildings are of mat and thatch only. Considerable saving in expenditure has thus resulted and all necessary requirements have been met. At the Mandalay station the tube well now supplies water to the Provincial Police School and other buildings in addition to those on the farm. The oil engine originally erected has proved unequal to the strain of this additional work and is about to be replaced by electric power. A much-needed laboratory for the Deputy Director and a store room for the Agricultural Chemist were both erected during the year, the additional space thus provided giving much relief to both these officers whose staff were previously much cramped for space.

With the completion of the buildings now erected or in course of erection the non-recurring grant from the Government of India for the equipment of the Agricultural and Veterinary Departments will be exhausted. It is hoped however that requirements for the next few years will be found to have been fully satisfied.

Experimental gardens:

9. There are now only two experimental gardens in the province maintained by the department, but under the supervision of district officers, namely at Falam in the Chin Hills and at Myitkyina. At Falam the garden did considerably better than usual chiefly owing to the energy of the Assistant Superintendent in charge, and the receipts rose from Rs. 209 to Rs. 387. Vegetables and fruit are the chief crops produced. The Myitkyina garden is now entirely devoted to wheat, gram and seed potatoes, no vegetables being grown. The outturn of wheat was 33·4 baskets per acre, worth Rs. 97-6-0. The Deputy Commissioner hopes as a result of the successful cultivation of the past two years that local cultivators may now be induced to take up this crop. Gram produced 13·3 baskets per acre valued at Rs. 39-5-0, but potatoes, from which much was expected, were not a success. In the first place the English seed potatoes of the previous year failed to keep through the rains. A fresh start was made with Darjeeling seed, but partly owing to lack of supervision the results were not very satisfactory. The opening of the new district of Putao not unnaturally absorbed the energies of all local officers last year, but the present Deputy Commissioner is a keen agriculturist and better results may be looked for next year. Myitkyina is undoubtedly excellently fitted for potato cultivation.

The Taunggyi garden was sold with effect from the 1st April 1914, and the establishment of an experimental station at Yaunghwe in its place is under consideration. I visited the Shan States with Mr. Thompstone in May when a site was selected and estimates for the necessary buildings prepared. The assistant who is ultimately to be posted to this station has been selected and has entered on a three years' course of training. Proposals have also been submitted for meeting both the preliminary cost of equipment and the recurring charges for maintenance, towards which the Yaunghwe *Sawbwa* has promised an annual contribution of Rs. 3,000.

Financial aspect.

10. The total expenditure under all heads on the upkeep of the gardens was Rs. 4,762 and the receipts totalled Rs. 1,027. The net cost to Government was, therefore, Rs. 3,735, or Rs. 1,477 less than last year.

Experiments through district agency.

11. Experiments through district agency have, as was perhaps to be expected, decreased almost to vanishing point. They have been to a large extent replaced by experiments made by cultivators on their own initiative. Several enquiries were however received during the year from district officers. The Superintendent of the Chin Hills is interesting himself in sugarcane and has started experimental work on that crop; and the Deputy Commissioner, Bhamo, is endeavouring to encourage the coffee cultivation introduced into the Kachin Hills by the Roman Catholic Mission. The Deputy Commissioner, Yamèthin, has been considering the possibility of growing oranges in the hill tracts to the east of his district, but the scheme does not appear to be likely to succeed at present. In the Kyaukse District Colonel Cronin, the late Deputy Commissioner, made use of the school gardens springing up under his auspices for the experimental cultivation

of various vegetables hitherto unknown to the villagers and succeeded in arousing a good deal of interest among them.

Cotton.

12. The study of cotton has now been taken up seriously by the department. The Tatkôn farm in the Yamèthin District and that at Padu in the Sagaing District are both devoting attention to the crop and the establishment of a seed farm in each of the three districts of Pakôkku, Myingyan and Thayetmyo has also been sanctioned.

Mr. Arno Schmidt, Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Associations, visited Burma in January, and as a result of his tour remarked that the Burma cotton crop contains a proportion of fairly long stapled cotton which, if carefully picked and made available separately in large quantities, would probably be as valuable as the best Indian cottons and command a price little below that of middling American. This is welcome information, but the problem is almost certainly purely a botanical one. Experiments made during the year both by the larger ginning firms and by the department show that careful selection of the seed cotton in mill compounds leads to little or no increase in value, and, though further experiments have been arranged for the careful picking of special samples on the field in three selected areas in the cotton tracts during the coming season under the supervision of the department, I do not anticipate that any great enhancement in value will be thus obtained. On the other hand there is every hope that the plant breeding work upon the experimental farms will produce a local variety greatly superior both in quality and outturn to the crop at present grown. One obvious difficulty to be surmounted is that the longer stapled Asiatic cottons are all long lived, and there seems to be a close relation between length of staple and life period, while the ordinary routine of the Burman cultivator demands that his fields should be clear in the hot weather. It is however certain that a very great advance can be effected by selection improvement alone.

The year under report was marked by the formation of a combine between the three leading ginning firms of Myingyan and Thayetmyo. This combine has not been without its advantages in that it has checked the watering of seed cotton which was freely indulged in by the brokers and other middlemen during the previous years of unrestricted competition. It has also had a considerable effect upon the prices realized by the cultivators. It was unfortunate that from outside causes the general level of prices should in any case have been low in the first year of the combine, and both by traders and cultivators the influence of the combine upon prices was overestimated. The result has been a widespread movement among the former towards the erection of local ginneries under their own management with a view to their emancipation from the control of the large firms. As the ginning power already in existence in the province is more than sufficient to gin a crop of 80,000 bales, the maximum output of the province hitherto realized, the appearance of these ginneries run by middlemen is likely to induce keen competition in the future by which the cultivator may possibly profit. How far they will be remunerative to their owners remains to be seen. From an agricultural point of view, however, they are not likely to be of much assistance in the improvement of the quality of the crop, though they may lead to the extension of cotton cultivation in tracts now too remote from the headquarters of the ginning industry at Myingyan for it to be remunerative.

Co-operative ginneries.

13. A more promising movement from the point of view of the department is to be found in the widely expressed desire of the cultivators of the cotton tract to make use of the co-operative organizations now appearing in many places for the purpose of the formation of co-operative ginneries. One of the chief difficulties confronting the progressive cultivator in the cotton tract is the impossibility of securing the return of his seed when he has obtained a more than usually good crop. He is bound to sell to middlemen and his crop is mixed by them with that obtained from other sellers. For his seed he has to make a special journey, often from a considerable distance to the mills at Myingyan, which, dealing with the crop in bulk, can at best only supply him with an average sample of the total output received by them.

So long as this system continues it is impossible for the department to control the supply of good improved seed when such become available from the farms. With the creation of small co-operative ginneries to deal with the seed of a union of co-operative societies this difficulty would disappear. Such ginneries being on the spot not only effect a great saving of time to the cultivator, but each cultivator can get his own seed back and so be sure of perpetuating any improved strain and of keeping it free from contamination by less careful neighbours. Moreover the seed thus got back can be properly stored and looked after by the cultivator and will therefore germinate better than that got from the large ginneries. It may of course be said that the creation of such ginneries will only add to the excess of ginning power already in the province and thus accentuate the growth of competition and its attendant evils of watering seed cotton, mixing qualities, etc. The question of the provision of good seed is however all important and the increase in ginning power will be more than compensated for by the extension of cultivation and the increased outturn of the crop. Of course should the cultivators find that they can obtain a better return by ginning all their cotton in their own ginneries and disposing of it direct to export merchants than by selling to the large mills or to middlemen these co-operative ginneries are likely to expand greatly. The remedy against this is in the millers' own hands and inasmuch as they deny having unduly depressed prices in the past year and disclaim all intention of so doing in the future, I do not see that they have anything to fear from the increased competition, while they have everything to gain from the progressive improvement of the crop. The justification of large business concerns is that they can work more economically and also watch the market more effectively. This being so they should always be able to offer higher prices to the cultivators than the net return obtainable by the latter through their own co-operative ginneries.

No such ginneries were actually started during the year under report but several may be expected to commence operations during 1914-15. The cultivators of the cotton tract are far from wealthy and the collection of the Rs. 5,000 which may be regarded as the minimum capital required for the establishment of such a ginnery is not always easy.

Possibility of tube well irrigation for cotton.

14. In connection with the expansion of cotton cultivation the question of irrigation is of great importance In Madras the introduction of Cambodia cotton and the good prices and yields got by its cultivation have led to an extensive movement in the way of well irrigation. In Burma there exists in the Thazi Subdivision of Meiktila and in the northern parts of the Yamèthin Subdivision a tract of land which now grows precarious crops of paddy but which could certainly be put to greater economic use by growing irrigated cotton of a good type such as Cambodia. Mr. McKerral, Deputy Director of Agriculture, Southern Circle, is now considering whether a system of tube-wells worked by oil engines could not be introduced in such tracts. The engine might also be used to run a small ginnery for the cotton produced and the whole be under the control of a co-operative society of local cultivators. The degree of uncertainty attending boring for water is the main difficulty in such a scheme but this should not be insuperable. It is hoped that it may be possible to submit some concrete proposal on the subject during the coming year.

Wheat.

15. There is little to report in connection with the development of wheat cultivation. The success again obtained at the Myitkyina garden with this crop has been already mentioned, and with the establishment of the new station at Hopin it is hoped that the introduction of this new staple to the cultivator of northern Burma will not be long delayed.

Cultivation of wheat in the Chin Hills was recommenced, but it is obvious that the interruption which occurred last year has been a serious setback. In the Shan States no great developments are to be expected until the completion of the railway to Yawnghwe, but the proposed farm, already dealt with, will undoubtedly greatly assist the expansion and improvement of the crop.

Castor.

16. Castor cultivation in the Kyauksè District continued to develop and samples of the crop were sent to several Rangoon firms. It is probable that a ready market is obtainable for the product and if this is so progressive expansion of the cultivation is to be anticipated. Several requests for seeds were received from cultivators in other districts and were complied with.

Jatropha Curcas.

17. The commercial prospects of a trade in the seeds of the "Jatropha Curcas" mentioned in last year's report were still further considered during the year. The Agricultural Chemist has reported favourably on samples received from the Meiktila District and is of opinion that there should be a fine market for the seed oil for soap-making. The Commissioners of the Upper Burma Divisions have been addressed on the subject of the assistance that can be expected from district officers in the organization of a trade in these seeds but all replies have not as yet been received.

Madagascar beans.

18. The experimental work conducted by the department in connection with Madagascar beans at Mandalay has already been mentioned. As stated in last year's report extensive trials with this crop were made by co-operative societies throughout the riverine tract of Upper Burma and also in certain other places. On the whole results were most encouraging, and the crop obtained has been readily disposed of as seed to other intending cultivators. Samples of the crop obtained were purchased by fourteen Rangoon firms, and, if their reports are favourable, there is every hope that the cultivation of this bean may assume considerable proportions.

Sugarcane.

19. Experiments with sugarcane are being undertaken on the small experimental station at Pwinbyu in the Môn canals area of the Minbu District, and sets will be available for distribution to cultivators in January 1915.

A proposal was made to Government during the year by a Rangoon firm for the conduct of an experiment in sugarcane cultivation in this area under the supervision of an expert from Java, with a view to discovering the suitability of the tract for sugarcane cultivation on a large scale and the erection of a factory equipped on the most modern lines. The proposal was accepted and Government has promised to meet half the cost of the experiment up to a maximum of Rs. 10,000. It is hoped that the experiment may be started in the coming year.

Miscellaneous.

20. No tobacco seeds were supplied by the department to district officers or cultivators during the year. The crop is a very important one and it is high time that its study was taken up by the department. Unfortunately the smallness of the superior staff has hitherto prevented this being done, and I fear will continue to do so, until a a third Deputy Director is made available for the province.

No rubber seeds were distributed during the year. Hitherto under the orders of Government all questions connected with rubber have been referred to the Forest Department. It has now been decided that rubber cultivation should in future be dealt with by this department, so far as its other work permits. There is no rubber expert on the staff, but the Deputy Directors and their assistants will give planters and others all the assistance in their power.

There continue to be a few enquiries for jute but there does not seem to be much prospect before this crop in Burma at present.

Soy beans were obtained in May last from the Imperial Institute, London, for experimental cultivation in the Pakôkku Hill Tracts, the Chin Hills and in the Yaunghwe Shan States. Hitherto the cultivation of this crop has not been very successful in Burma. The distribution of English vegetable seeds was confined to the Superintendents of the Northern and Southern Shan States and to a few schools and cultivators.

Chemistry.

21. Mr. F. J. Warth, M.Sc., Agricultural Chemist, was in charge of the Chemical Branch throughout the year. One hundred and sixty analyses were completed, this figure being exclusive of preliminary analytical experiments with starch, with soil

water and with oils. Measurements and weighments were carried out with 360 pots planted with paddy in August 1913.

In field culture work, the examination of paddy varieties could not be continued. The cultures have, however, been maintained with a view to further study in the current year. The manurial plots have been further extended by the addition of another series of organic and inorganic nitrogen, previous results having shown that on Mandalay soil the ripening of paddy is affected to an unexpected degree by artificial manures.

Observations extending over two years have shown that marked differences in composition and seed weight are produced by growing the same variety of paddy on different soils. In view of the importance of these differences with reference to the selection of seed producing areas the work has been extended and now involves the cultivation and examination of paddy at six stations. Thirty-two oils and oilseed samples were examined during the year. It is proposed to continue the examination of oils derived from various indigenous oilseeds.

Dairying.

22. A small experimental dairy was opened at the Mandalay station during the year under the charge of Mr. Warth. This new development was due to the receipt of applications for assistance from the co-operators of the Ava Township of the Sagaing District who were engaged in cattle breeding and dairying, to enable them to improve their methods and thus compete for contracts with the Supply and Transport Department.

The work at present consists of the examination of local feeding stuffs and fodders and the working out of suitable rations, together with the preparation of butter and the examination of milk and dairy products. It is too early at present to forecast the results that are likely to be obtained; but there is so far every reason to think that they will be eminently satisfactory.

Botany.

23. Mr. R. Beale, Assistant Botanist, Southern Circle, joined his appointment on the conclusion of his training at Pusa just before the end of the year. Mr. A. M. Sawyer, Assistant Botanist, Northern Circle, was mainly employed in selection experiments, and in research work in the field and laboratory at Mandalay. In connection with paddy the most important work undertaken was the examination and selection for future work of 56 hybrids which themselves white grained were the result of the splitting up of a heterozygous red-grained paddy, and the supervision of grouping, spacing and manuring experiments under the control of the Deputy Director of Agriculture, Northern Circle. Considerable progress was made with the catalogue of Upper Burma paddies during the year.

A careful botanical study of the Pwinbyu (striga lutea) a parasite which has done much damage recently to jowar in the dry zone was commenced during the year. This study is at present incomplete and will be continued. The host plants of the parasite have however been found to be both many and varied, and the exclusiveness of its parasitism on its host plants has been clearly established. An unexpected result of the year's work was the apparent insufficiency of the action of the parasite to effect of itself the damage which is usually attributed to it alone by cultivators and other observers in the districts where it is found. It is clear that the problem of dealing with this plant, which is of great importance to the jowar crop of the province, is by no means an easy one and next year's results will be awaited with interest.

A study of the life history of the water hyacinth (Eichhornia crassipes Solms) was commenced towards the close of the year. As in past seasons a number of requests for information were received both from officials and from the public and assistance was given wherever possible. Numerous additions were also made to the herbarium and museum during the year.

Entomology.

24. Mr. K. D. Shroff has been Assistant Entomologist throughout the year. A bulletin on the paddy pests of Burma is under preparation and several tours were undertaken in connection with the collection of materials for this work. In the course of one

of these tours Mr. Shroff's assistance was invited by the people of Minhla in the Tharrawaddy District where the rhinocerous beetle is doing much damage to cocoanut palms. The pest is slowly spreading northwards towards Prome and united efforts on the part of all tree owners are necessary if the pest is to be stamped out. Action on the part of district officers to this end would appear to be desirable.

Other field work undertaken during the year included a collection of insects both of general and of economic interest, the spraying of garden plants, the treatment of some 300 white ant mounds, success resulting in 90 per cent. of the mounds treated, and the trapping of cock chafers by means of Meduse lamps, 72,784 chafers being destroyed in thirteen days.

In addition to ordinary laboratory work experiments were begun on some granary pests, the object being to discover the necessary proportion of carbon bisulphide and naphthaline required for the successsful treatment of various kinds and qualities of seeds without affecting their germinating power.

Numerous enquiries were received and advice was given wherever possible.

At the request of the Agricultural Adviser to the Government of India Mr. Shroff also prepared an illustrated report on the silk-weaving industry of Amarapura.

CHAPTER IV.

DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

Demonstration. Aid to the public.

25. The posting of six district agriculturists to the districts of Shwebo, Minbu, Yamèthin, Pegu, Toungoo and Insein in April last has provided a means for the commencement of demonstration work previously non-existent. The Mandalay farm continues to attract a number of visitors and the other stations of the department are also becoming known. The implement store at Mandalay supplied many cultivators with implements recommended by the department. A list of the implements sold is attached. Negotiations are now on foot with Messrs. Cowie & Co. of Rangoon, who also have a branch in Mandalay, for them to keep a stock of these implements both in Rangoon and Mandalay for retail sale to the public, and thus relieve the department of this growing business. Visits were made both by Deputy Directors and by other members of the staff to the holdings of a considerable number of cultivators during the year for the purpose of fixing pumps, giving advice on agricultural matters and other purposes.

26. Special action was taken by the department in the concluding months of the year to counteract the ill effects of a possible failure of irrigation in the Mandalay canal area. The headworks of this canal were partially destroyed in a serious flood at the end of last rains and it was for some time doubtful whether repairs could be effected in time to provide irrigation in the present season. With Government's consent some Rs. 20,000 was spent in the purchase of sesamum, Kunpyaung and Sanpyaung seed for distribution to cultivators in the event of failure.

Luckily all went well and the stocks purchased were not required. Most of them have now been resold, but unfortunately the traders of Mandalay had apparently also laid in stocks for the same purpose as the department. The prices expected were not therefore realized. At the present time all but 2,000 baskets of Kunpyaung have been sold for Rs. 12,400 odd leaving a deficit of Rs. 6,568-6-0. This Kunpyaung is being kept in stock in case it may be required for the Môn canals area where damage was done by a flood at the commencement of the rains and some failure of irrigation may occur.

There will thus in any case be a loss on the whole transaction. As a measure of insurance against the disastrous results that would have followed on a failure of irrigation in the Mandalay canal tract, the venture seems to me to have been well worth while.

Shows.

27. The Bhamo Agricultural and Livestock Show was held as usual in March. Exhibits were numerous but the show has hitherto had no effect either on the breeding of live-stock in the district or on the improvement of agriculture. In this respect it only confirms the opinion formed as the result of former shows in other parts of the province that, until a spirit of vigorous and progressive emulation can be aroused, shows are of no value as an aid to agricultural improvement. Proposals have been submitted for the discontinuance of this show in future years, on the ground that the expenditure incurred in prizes and in the visits of agricultural and veterinary officers is not justified by the results achieved. The Agri-Horticultural Society of Burma held their usual show in Rangoon.

General progress.

28. The year has been marked by a considerable development in the work of the department. Several new farms have been opened and the staff of assistants has been increased. The results of this expansion have not yet had time to make themselves felt, but the increased opportunities for a closer touch with the cultivators thereby created are already obvious.

The second Provincial Agricultural and Co-operative Conference was held at Mandalay in August and was attended by 900 delegates of societies and other visitors official and non-official. Agriculture played a larger part in the discussions than at the first conference, and I am glad to be able to report that as a result of the conference Resolution on the subject several co-operators are proposing to start the cultivation of improved seed from the experimental farms with a view to its sale to neighbouring cultivators. The importance of these conferences cannot in my opinion be overestimated, and I trust that the close connection between the Agricultural and Co-operative Departments, which is so largely the result of them, will continue in future years.

CHAPTER V.

AGRICULTURAL ENGINEERING.

29 Agricultural engineering has hitherto found no place in the programme of the department. Its importance is however now becoming evident. The province as a whole is at the present time emerging from a system of primitive agriculture into one in which more advanced methods will prevail. The necessity for improved and more rapid methods of dealing with crops has become apparent to Burmese cultivators, and is shown by the fact that of their own accord they are taking to oil engines for cutting millet stalks and that the department has frequent enquiries for apparatus for lifting water and other agricultural purposes. It is comparatively easy to supply such machines but for effective use to be made of them the presence of persons who can handle them efficiently and repair damages when they occur is necessary. The local type of blacksmith is however at the present moment very unfitted to tackle work requiring any skill whatever. A demand is therefore arising for the diffusion of mechanical knowledge among the cultivators of the province, to which it is very desirable that some response should be made. At one time I was of opinion that this need could be partially met by the holding of a mechanical class at one or more of the experimental stations of the department. The staff of these stations is however already fully employed, and in addition the demand is, I think, likely to become altogether beyond our means to satisfy. Under these circumstances I asked Mr. McKerral to discuss the question with the Principal of the Provincial Engineering School, Insein, as being one intimately connected with the development of technical education in the province. I have received some proposals from which I trust that a satisfactory scheme may be evolved and am proposing to address the Education Department in the matter.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Publications.

30. During the year the following cultivators' leaflets were published :—

No.	Subject.	Author.	Language: English and Burmese.
1	2	3	4
43	Chaff cutters and bullock gears	Mr. E Thompstone ...	English and Burmese.
44	The symptoms of "Ufra," a disease of the rice plant.	Mr. A. McKerral ...	English and Burmese.

Two bulletins were also published.

No. 10. The Chemical composition of paddy mill products by Mr. F. J. Warth, M.Sc. and Mr. D. B. Darabsett.

No. 11. The cultivation of the cocoanut palm in Burma by Mr. A. M. Sawyer.

A bulletin on peas and beans by Mr. E. Thompstone and Mr. A. M. Sawyer is in the press.

The Burma Agricultural Calendar for 1914-15 also was published in Burmese.

Supply of information.

31. Requests for information from the public are annually increasing in number, both in the case of my office and in that of the Deputy Directors, the Agricultural Chemist and their assistants. This was only to be expected, inasmuch as thanks to the Provincial Conferences and the sympathetic references to the department in the press, both English and Burmese, its work is becoming much better known. There is every reason to hope that the district agriculturists will greatly facilitate the referring of the problems encountered by those actually engaged in agriculture to the department, to the probable great advantage of both parties. With the Burma Chamber of Commerce the relations of the department continue to be cordial, and numerous firms have applied for information on various subjects during the year.

CHAPTER VII.

MISCELLANEOUS.

Poultry breeding.

32. Poultry breeding on the Mandalay farm continued on a small scale. The moving of the runs to a more protected site has diminished the thefts from which they formerly suffered, but jungle cats continue occasionally to take toll of the stock. Poultry breeding must at present play only a subsidiary part in the work of the station, the staff being fully occupied with other more important work. As the man in charge gains experience it may be practicable to develop it on a larger scale.

Departmental Conferences.

33. Departmental Conferences continue to be held every six months, and the presence of the Registrar and Assistant Registrar of Co-operative Societies at them has greatly facilitated the maintenance of a close touch between the departments. I regard these conferences as of great value in co-ordinating the work of the various officers of the department. Now that the number of assistants has been increased it will probably be desirable to arrange for them to meet at least once a year to discuss the problems with which they are dealing.

Conclusion.

34. The work of all officers has again been excellent and I would specially bring to notice that of the three members of the superior staff, Messrs. Thompstone, Warth and McKerral. They are much to be congratulated on the advance achieved in spite of the unduly extensive areas over which they have control. Thanks are again due to many district officers and settlement officers who have given much valuable assistance during the year, and also to the Burma Chamber of Commerce which has displayed its usual sympathetic interest in the work of the department.

H. CLAYTON,

MANDALAY, 15*th August* 1914. *Director of Agriculture, Burma, Mandalay.*

APPENDICES.

		PAGE
APPENDIX I.	—Statement of receipts and expenditure for experimental cultivation during 1913-14.	15
APPENDIX II.	—Administration Reports of the Agricultural Stations, Mandalay and Hmawbi, for 1913-14.	16—30
APPENDIX III.	—List of implements sold from the Implement Depôt, Mandalay Agricultural Station.	31

APPENDIX I.

Receipts and expenditure for experimental cultivation during the year 1913-14, *exclusive of the Agricultural Stations at Mandalay and Hmawbi.*

No.	Stations.	Budget allotment.	Receipts from the sale of produce.	Expenditure.							Total.
				Establishment.	Wages of Farm maistries and coolies.	Feed and upkeep of stock.	Purchase of seed and fruit trees.	Upkeep of gardens, fencing and trenching.	Purchase of live-stock and agricultural implements.	Miscellaneous contingencies.	
1	2	3	4	5	6	7	8	9	10	11	12
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Chin Hills (Falam)	1,274	387	581	...	...	56	54	...	255	946
2	Myitkyina ...	1,403	132	918	...	...	200	96	...	..	1,214
3	Southern Shan States (Taunggyi).	3,628	508	2,518	...	23	7	...	13	41	2,602
4	Distribution of seed from headquarters.	2,530	...	...	...	...	1,717	...	...	...	1,717
5	Distribution of Agricultural implements.	500	...	...	...	...	...	...	73	...	73
6	Purchase and hire of cattle.	500	...	...	...	...	...	...	495	...	495
	Total ...	9,835	1,027	4,017	...	23	1,980	150	581	296	7,047

APPENDIX II.

ADMINISTRATION REPORT OF THE MANDALAY AGRICULTURAL STATION FOR THE YEAR ENDED JUNE 30TH, 1914.

I. *General.*—The area under cultivation remains the same as last year except that 7·56 acres of dry-crop land were handed over to the Agricultural Chemist for dairy work and an area of 2 acres given over to the new seed laboratory. The total area occupied by paddy—including experimental and seed production areas, with mud roads and water courses between plots—was about 240 acres and that covered by dry and fodder crops 109 acres. Buildings and roads, including compounds and threshing floors, etc., cover a space of 21 acres and the pasture land 50 acres.

The Agricultural and Co-operative Conference of 1913 resulted in an increased demand for pure and improved varieties of seed, and in consequence we have been compelled to add a large number of breeding plots and to greatly increase our seed production area. We have also constructed threshing and drying floors in order to deal more easily with this branch of work.

A new series of manurial experiments was commenced in section D, the other experiments being a continuation of previous year's work. Some of the old experiments will shortly be drawn to a close, as nothing further can be learnt by their continuation. An account of the experiments and other work carried out may be found in the General Report printed separately.

The season was a poor one and dry crops were not good owing not only to the deficient rainfall but also to the irregular distribution and to the damaging winds. The yields of paddy were poorer than usual on account of the shortage of canal water during the latter part of the season. The late rains failed and in consequence cold weather crops were poor. The principal work on some of these crops (*e.g.*, wheat, gram) will in future be transferred to the two new stations of Padu and Hopin.

The Natywagôn and Bugyi sub-stations formed part of this farm for administration purposes and the expenditure is included in that given below.

II. *Staff.*—Considerable changes took place in the establishment during the second half of the year, Maung Tin, II, probationer, resigned on 6th December 1913. Maung Po Oh, a temporary clerk of No. 6 Settlement Party, was appointed on 7th January 1914 to fill the vacancy and reverted to his substantive appointment on 1st June 1914. Maung Tu, probationer, was transferred to Hmawbi as a sub-overseer on 1st April 1914 and his place was filled by Maung Ba Tu, an outsider, on 7th April 1914. Maung Po Myat, overseer, was reduced to sub-overseer for three months from 1st January 1914. From 1st April 1914 he was granted two months and ten days' privilege leave which was extended with three months' leave on medical certificate. His place remained vacant till 11th June 1914 when Maung Tha, a clerk of the Deputy Commissioner's office, Mandalay, was appointed temporarily as a farm clerk so as to free the sub-overseers from clerical works. Maung Tha Dun, sub-overseer, was promoted to overseer on 1st January 1914. Maung Tha Zan, sub-overseer was granted three months' privilege leave from 17th April 1914 and no one was appointed in his place.

Two probationary District Agriculturists, Maung Thin Nya and Maung Pauk Sa, were admitted on 1st April 1914 and the probationary Assistant Maung Ba Maung for the Shan States arrived on 2nd June 1914. These three men do not, strictly speaking, belong to the farm staff but are undergoing training on the farm. We have also had from time to time men sent by Co-operative Credit Societies for training in seed-selection and similar work, and these men have been made use of during the busy seasons.

III. *Housing and Sanitation.*—We have made an endeavour to improve the condition of the surroundings of the houses belonging to the staff and of the farm buildings by digging a drain to the new Mandalay drain which runs along the west side of the farm. This with the construction of a culvert to carry the water beneath the irrigation canal has been one of the principal permanent improvements carried out during the year; but unfortunately the new Mandalay drain is not yet opened and for the present we remain in the same position as before. When the new drain is opened we shall be able to get rid of the swamps which are found around the buildings and it is hoped that the considerable amount of illness which has occurred during the past year will not recur.

Two coolies died on the farm during the year—one of malaria and the other of suspected cholera. This number was considerably less than the previous year, when six died from malaria ; but the difference is probably due to the fact that as soon as any illness occurred many of the coolies left the place. Unfortunately this happened at a busy time and we had great difficulty in obtaining labour. The small medicine box supplied by the Government Medical Stores was most useful especially in cases of malaria but the quinine was exhausted in a very short time.

IV. *Labour.*—The cost is more than double that of most parts of India, hence the heavy expenditure under this head and under that of "Upkeep of garden, etc." The

principal difficulty is housing. Our coolies are very poorly housed in wretched huts and sickness is common among them. The trouble can only be overcome by providing quarters for some of the permanent workmen. Work is plentiful around Mandalay and without free quarters we cannot obtain an intelligent class of workmen who can be trained to carry out the work required of them without constant supervision of the staff.

V. *The Water-supply.*—The water-tank and pipe line were completed and we have been able with difficulty to maintain a satisfactory supply of water. The Public Works Department decided that the Police Training School, Court-house, etc., must be supplied from our well. They put in the necessary pipe line and a compressor—the latter to replace the force pump. When this had been completed it was found that the engine could not run the compressor at the speed estimated, and the speed had to be reduced by putting one of our smaller pulleys (a 4′ diameter one) on to the main shaft. The result of this is that the engine can now just manage to run the compressor which is very inefficient. The quantity of water lifted is about three times that forced up the old pump, but the power expended is nearly seven times as great. This is very unsatisfactory working and has resulted in very heavy expenditure during the year for pumping purposes. Since the pipe-line to the Police School was opened, the cost of the oil feul for pumping has been met by the Public Works Department. Still Government has to meet the cost which is undoubtedly much higher than it ought to be. Besides this no engine will continue to run for long hours each day at full load as ours was forced to do during the busy threshing season. The engine and machinery were originally arranged so that the pumping could be done simultaneously with the farm work, but the compressor is itself a full load, and as no reserve power has been provided, such as is usual with installations of this kind, we have often been compelled to work the engine for fourteen hours per day. In consequence of this she is already showing signs of wear and requires overhauling.

The Public Works Department has now arranged to supply an electric motor of 25 H. P. and to allow the present engine to remain as a "standby" in case of accident. This will be a great improvement and will greatly simplify this branch of the farm work, but unless the compressor be made to work more economically there will not be a very great saving of expenditure.

VI. *Cattle.*—Two deaths occurred during the year, one from old age and the other from long sickness resulting from an accident already mentioned in last year's report. A few of the cattle suffered from foot-and-mouth disease, but these were carefully attended to and the disease checked by the Veterinary Inspector, Mandalay. Three aged bullocks were disposed of and nine new ones bought; thus we have an increase of two pairs in stock. Our present cattle-shed accommodates only thirty pairs and there is no room for the extra two and half-pairs which are at present kept under the fodder-shed. The prices of cattle is about 20 per cent. higher than that of previous years. The cattle are all in good working condition.

Fodder and Food.—Fodder was plentiful and we have a large surplus of paddy straw which was not disposed of this year owing to the uncertainty of the water-supply for irrigation. Now that we are certain of at least a moderate supply of water this surplus will be disposed of.

VII. *Manures.*—The work of the construction of the new manure tank has been put in hand by the Public Works Department and when completed we do not anticipate any more trouble in storing our cattle manure.

VIII. *Implements and Machinery.*—The sales from the Implement Depôt have increased considerably. The scheme has been a complete success and all implements, except those under trial, are now supplied from the depôt. The balance sheet and list of implements in stock are attached to this report.

The business done, is rapidly increasing beyond the capacity of our small staff and the question of handing it over to some reliable firm was discussed at the Departmental Conference held in June last. The firm would be required to establish a depôt, keep a stock of approved implements, do the fitting of those implements arriving in parts and execute the orders we pass on to them. Steps will be taken as soon as convenient to carry this into effect and so to relieve the farm staff of the business.

The same implements as mentioned last year are mostly in demand, *viz.*, chain pumps, chaff-cutters, winnowers, "Gwin sets," "Cyprus" and "Beeloo" ploughs.

A new type of bullock-thresher was tried and worked successfully on paddy with short straw, wheat, gram, etc Five new ploughs were tried but they were not found to be satisfactory. An account of these trials is given in the General Report of the farm.

In connection with the seed-selection, testing and distribution work we bought for use on the farm one hand rice huller, one eliminator and a seed screener. The last came from Europe.

IX. *Seeds and Produce.*—Seed selection and distribution work has again increased very greatly. Co-operative Societies were supplied as usual with selected and other seeds. Two tons of *Pebyugyi* imported by the Director of Agriculture were distributed among 12 unions and a number of private individuals at the nominal price of Rs. 2-8-0 per basket. A great

many of the fields of this crop were inspected and samples of the produce collected for examination. The results have on the whole been satisfactory though in some cases failures were recorded.

The seed selection work on society paddies had to be postponed on account of the complete failure of most of the seed supplied to us. The samples sent were of the poorest description, mixed, dirty, irregular in size, colour, etc., but we have taken nine of the most important for line-breeding work this year (1914-15).

Receipts from sales of produce amount to only Rs. 2,885-14-6. The reason of this is the low prices of paddy which have induced us to stock our produce for a rise in the market. We have 5,300 baskets in stock and the market is rising. We shall shortly effect a sale the proceeds of which will be credited to next year's account.

Seeds were distributed free to the value of Rs. 206-10-0 and the produce in hand is valued at Rs. 9,235-8-8.

X. *Accounts.*—A statement of receipts and expenditure (exclusive of staff and produce in hand on July 1st, 1913) is attached. The large amount of produce in hand and the consequent low receipts are, as already explained, due to the unfavourable market for paddy and to the uncertainty of the water-supply for irrigation.

The balance sheet of the Central Implement Depôt for the year ending March 31st, 1914, and a list of implements sold, are also attached.

E. THOMPSTONE,

MANDALAY, 31*st July* 1914. *Deputy Director of Agriculture, Burma.*

Statement showing the Expenditure of the Agricultural Stations, Mandalay, Natywagôn and Bugyi, for the year ended 30th June 1914.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SUPPLIES AND SERVICES.		
*Wages of farm maistries and coolies	10,930 14 4	
Feed and upkeep of stock	701 2 6	
Purchase of seed and fruit trees	486 2 6	
Upkeep of garden, fencing and trenching	1,202 3 4	
Purchase of livestock and agricultural implements	2,664 12 1	
Petty construction and repairs of work	544 0 0	
		16,529 2 9
Contingencies:—		
Service postage and telegram charges	24 9 0	
Purchase of furniture	8 9 0	
Freight, shipping and landing charges	269 4 5	
Purchase of books and periodicals	...	
Office expenses and miscellaneous	1,343 13 9	
		1,646 4 2
GRAND TOTAL ...	.....	18,175 6 11
* { Includes labour expended for the Agricultural Chemist, Burma ..	117 0 0	
* { Includes labour expended for the Economic Entomologist, Burma	30 0 0	

Statement showing Receipts of the Agricultural Station, Mandalay, for the year ended 30th June 1914.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
Sale of Farm Produce.		
Paddy	2,530 0 0	
Gram	80 0 0	
Wheat	44 8 0	
Oats	36 0 0	
Pe-sein-gon...	3 0 0	
English vegetable seeds	19 8 6	
Pyaung seeds	10 12 9	
Pyaung or jowar stalk	150 0 0	
Paddy straw	134 9 9	
		3,008 7 0
Value of implements distributed :—		
Sale of implements	469 12 0	
Implements Book Transfer through the Director of Agriculture, Burma.	92 0 0	
Sale of gunny bags and old iron	86 13 6	
		648 9 6
Value of seed distributed :—		
Seeds distributed free	206 10 9	
Seeds sold to Co-operative Credit Societies not yet paid for ...	87 0 0	
		293 10 9
Hire of winnowing machine	130 2 0	
Hire of farm cart	20 8 0	
Hire of chopping straw and jowar stalk	12 4 9	
		162 14 9
		4,113 10 0
Value of produce on hand :—		
Paddy at Rs. 125 per 100 baskets	6,639 14 4	
Oats	53 0 0	
Wheat...	12 8 0	
Gram	242 0 0	
Pyaung seeds	38 0 0	
Linseed	57 0 0	
Pyaung or jowar stalk	525 0 0	
Paddy straw	1,162 6 4	
Paddy straw (bundles)	429 0 0	
Miscellaneous	66 12 0	
		9,235 8 8
Grand Total ..	.....	13,349 2 8

Implement Depôt Balance Sheet.

Date.	Expenditure.	Rs. A. P.	Rs. A. P.	Date.	Receipt.	Rs. A. P.	Rs. A. P.
25th April 1913.	Drawn on Treasury voucher No. 684.	645 0 0		9th April 1913.	Credited into Treasury, *vide* chalan No. 9.	27 0 0	
26th April 1913.	Drawn on Treasury voucher No. 703.	23 8 0		7th May 1913.	Credited into Treasury, *vide* chalan No. 3.	197 8 0	
26th April 1913.	Drawn on Treasury voucher No. 704.	220 0 0		23rd May 1913.	Credited into Treasury, *vide* chalan No. 5.	106 0 0	
20th May 1913.	Drawn on Treasury voucher No. 567.	653 12 0		2nd May 1913.	Credited into Treasury, *vide* chalan No. 6.	125 0 0	
20th June 1913.	Drawn on Treasury voucher No. 589.	119 12 0		23rd May 1913.	Credited into Treasury, *vide* chalan No. 7.	470 0 0	
11th August 1913.	Drawn on Treasury voucher No. 430.	59 0 0		29th May 1913.	Credited into Treasury, *vide* chalan No. 10.	65 0 0	
21st September 1913.	Drawn on Treasury voucher No. 717.	465 4 0		4th June 1913.	Credited into Treasury, *vide* chalan No. 1.	300 0 0	
8th October 1913.	Drawn on Treasury voucher No. 440.	64 0 0		4th June 1913.	Credited into Treasury, *vide* chalan No. 2.	46 0 0	
23rd October 1913.	Drawn on Treasury voucher No. 612.	208 0 0		11th June 1913.	Credited into Treasury, *vide* chalan No. 6.	27 0 0	
4th November 1913	Drawn on Treasury voucher No. 239.	432 14 0		16th June 1913.	Credited into Treasury, *vide* chalan No. 7.	46 0 0	
27th November 1913.	Drawn on Treasury voucher No. 733.	438 14 0		21st June 1913.	Credited into Treasury, *vide* chalan No. 8.	70 0 0	
6th January 1914.	Drawn on Treasury voucher No. 41.	321 3 6		30th June 1913.	Credited into Treasury, *vide* chalan No. 5.	56 0 0	
23rd January 1914.	Drawn on Treasury voucher No. 127.	319 9 0		10th July 1913.	Credited into Treasury, *vide* chalan No. 2.	29 8 0	
24th January 1914.	Drawn on Treasury voucher No. 134.	215 0 0	4,074 12 6	15th July 1913.	Credited into Treasury, *vide* chalan No. 3.	79 8 0	
				4th August 1913.	Credited into Treasury, *vide* chalan No. 1.	26 0 0	
	Add value of implements on hand on 31st March 1913.	...	1,901 12 8	12th August 1913.	Credited into Treasury, *vide* chalan No. 2.	26 8 0	
				2nd September 1913.	Credited into Treasury, *vide* chalan No. 1.	60 0 0	
	Total Expenditure ...		5,979 9 2	5th September 1913.	Credited into Treasury, *vide* chalan No. 3.	26 8 0	
				15th September 1913.	Credited into Treasury, *vide* chalan No. 4.	132 8 0	
	* Balance being excess of receipts over expenditure.	...	200 13 2	29th October 1913.	Credited into Treasury, *vide* chalan No. 1.	208 4 0	
				4th November 1913.	Adjusted by book transfer by Director.	26 12 0	
	Tota ...	...	6,180 3 4	5th November 1913.	Credited into Treasury, *vide* chalan No. 1.	444 0 0	
				18th November 1913.	Credited into Treasury, *vide* chalan No. 2.	143 0 0	
				21st November 1913.	Credited into Treasury, *vide* chalan No. 3.	125 0 0	
				21st November 1913.	Credited into Treasury, *vide* chalan No. 4.	77 12 0	
				26th November 1913.	Credited into Treasury, *vide* chalan No. 5.	46 0 0	
				10th December 1913.	Credited into Treasury, *vide* chalan No. 2.	250 0 0	
				7th January 1914.	Credited into Treasury, *vide* chalan No. 1.	52 0 0	
				7th January 1914.	Credited into Treasury, *vide* chalan No. 2.	330 0 0	
				7th January 1914.	Credited into Treasury, *vide* chalan No. 3.	150 0 0	
				12th January 1914.	Credited into Treasury, *vide* chalan No. 4	72 0 0	
				12th January 1914.	Credited into Treasury, *vide* chalan No. 5.	125 0 0	
				14th January 1914.	Credited into Treasury, *vide* chalan No. 8.	46 0 0	
				20th January 1914.	Credited into Treasury, *vide* chalan No. 9.	46 0 0	
				30th January 1914.	Credited into Treasury, *vide* chalan No. 12.	125 0 0	
				13th February 1914.	Credited into Treasury, *vide* chalan No. 1.	92 0 0	
				24th February 1914.	Adjusted by book transfer by Director.	43 0 0	
				25th February 1914.	Credited into Treasury, *vide* chalan No. 3.	138 0 0	
				16th March 1914.	Credited into Treasury, *vide* chalan No. 9.	125 0 0	
				18th March 1914.	Credited into Treasury, *vide* chalan No. 10.	46 0 0	
				18th March 1914.	Credited into Treasury, *vide* chalan No. 13.	42 0 0	
				18th March 1914.	Credited into Treasury, *vide* chalan No. 14.	46 0 0	
				26th March 1914.	Credited into Treasury, *vide* chalan No. 49.	46 0 0	
				26th March 1914.	Credited into Treasury, *vide* chalan No. 50.	26 0 0	4,649 12 0
					Less value of implements sold in 1912-13 for which cash was received after 31st March 1913.	...	1,331 8 0
					Total ...	...	3,318 4 0
					Add value of implements in stock.*	...	2,091 15 4
					Add value of implements sold for which cash has not yet been received.	...	770 0 0
					GRAND TOTAL ...	...	6,180 3 4

* The selling price exceeds the cost price by a small percentage calculated to cover cost of handling, etc.

* Calculated cost price only. List attached.

Implement Depôt Stock on 31st March 1914.

No.	Implement.	No.	Value (Purchasing price).	Remarks.
			Rs. A. P.	
1	" Beeloo " plough No. 1	5	117 8 0	
2	Shares for above	58	54 6 0	
3	" Beeloo " plough No. 2	4	108 12 8	
4	" Beeloo " plough No. 3	3	101 4 0	
5	Shares for above	12	16 8 0	
6	Winnower No. 1	2	430 0 0	
7	Winnower No. 3	1	185 0 0	
8	Winnower No. 4	1	205 0 0	
9	Winnower No. 5	1	580 0 0	
10	Riddles No. 1	(sets) 3		
11	Riddles No. 2	(set) 1		
12	Riddles No. 3	(set) 1	151 0 0	
13	Riddles No. 4	(set) 1		
14	Hand chain pump	1	64 0 0	
15	*Cwin* Sets	7	182 0 0	
16	Spare teeth	88	19 0 0	
17	New Cyprus Ploughs	5	77 8 8	
	Total		2,091 15 4	

REPORT OF THE HMAWBI AGRICULTURAL STATION FOR THE YEAR 1913-14.

1. *General.*—The area of this station, which is situated on the Rangoon-Prome Road and Railway in north latitude 17°, and east longitude 96° is 424 acres. This includes a previously chosen but ultimately rejected building site of 13 acres. The present building site is 11 acres in extent and the remaining part of the area is entirely devoted to experiment with the rice crop. It has not as yet been found possible to utilize the former building site of 13 acres but as the problems of rubber cultivation have been handed over to the Agricultural Department it may be found convenient to turn it into a small experimental garden for the latter crop.

During the present year 85 more acres have been laid out and properly provided with bunds, roads, and water channels. This brings the laid-out area up to 160 acres. The remaining part of the station has been let out to the local co-operative credit society and to a few outside cultivators.

During the year a water-course was cut along the whole length of the farm in order to remove surplus drainage and prevent the flooding of experimental plots, which previously has been entirely at the mercy of the rainfall.

The buildings mentioned in last year's report have been practically completed, and entry will be made to all of them shortly. They include:—

Seed laboratory (three rooms).
Machinery shed.
Implement shed.
Seed and manure godowns.
Cattle sheds to accommodate 40 pairs of cattle, with manure pit.
Quarters for subordinate staff.
Bungalow for Assistant Botanist.
Rest-rouse for visitors.

Equipment has also been provided at a cost of Rs. 10,500. It includes:—

12 B. H. P. oil engine.
Rice thrasher by Messrs. Ransome Sims & Co.
Sugar-cane crusher.
Chaff cutter.
Hand thrasher.
Plough, winnowers, carts, etc.
Bullock weighbridge.

Ten more pairs of cattle have been purchased locally bringing the number up to 19 pairs.

2. *Staff.*—During most of the year the farm was under the charge of Maung Ba, Overseer, who was assisted by Maung Ba Gale, Sub-overseer. In April the latter was sent to relieve Maung Po Than at Pwinbyu and his place has been taken by Maung Tu, from Mandalay. An extra sub-overseer has been got in the person of Ko Ko Gale who came from the Insein Engineering School. Sanction of Government has also been obtained to the training of a Superintendent for this station and Maung Gale, also from the Insein Engineering School, has been chosen for the post. He will undergo two years training on the various stations of the department.

Sanction has also been obtained to the entertainment of a temporary Superintendent, in the person of Maung Po Ka, Retired Settlement Inspector, for one year from June 24th, 1914, to take the place of the Superintendent who is at present being trained.

Mr. R. Beale, who has completed his two years training at the Poona Agricultural College, Bombay, has been appointed Assistant Botanist and assumed charge of his duties at Hmawbi in May. He will be in immediate charge of all the experimental and seed selection work of the station and will assist in the training of the station and district staff.

3. *Training of District Agriculturists.*—During the year six men intended for the post of district agriculturists received training in rice selection work at the station. They came in April 1913 after having had previous training in Mandalay and finished in March 1914. All have now been posted to districts. Their training consisted in a thorough practical grounding in the characters of the different types of paddy, on the results of crossing as seen on natural hybrids, and on the method of selecting paddy for purity and yield. Each man was given a variety of paddy of which 100 single-ear cultures had been selected in the previous year. The method of selection was then explained to him and forms were made out on which he had to record his observations, the work being regularly checked to insure accuracy. This work, which is very laborious,

should have the effect of making each of these men a close and accurate observer of differences among the types and of making each able to perform such selection if called on at any future time.

4. *Character of the season.*—As the set of meteorological instruments did not arrive till after the end of the year no records for rainfall and temperature are as yet available. It may be remarked, however, that a feature of the season was a rather long break in the rains immediately after the bulk of the transplanting had been done. The result of this was a decided decrease in the yield of paddy got as compared with the previous year's records. A rain-guage, anemometer and wet and dry bulb thermometers are being installed for the accurate observation of the meteorological conditions.

5. *Nature of the soil.*—This may be described as a laterite loam. When dry it is of a yellowish colour but darkens on wetting. In the wet state it is not tenacious like the so-called black cotton soil of Upper Burma, and is remarkable for the extreme rapidity with which the surface soil loses water on drying. It is apparently fertile under irrigation in the hot weather as is shown by the good crops of beans, cucumbers, etc., got near Rangoon by irrigation from wells A kutcha well has been dug on the farm for experiments with second cropping by means of irrigation and for the study of the improvement of the physical texture.

The following is the chemical analysis of Hmawbi soil by the Agricultural Chemist:—

Insoluble matter	84·57
Ferric oxide	2·94
Alumina	7·06
Lime (Ca O)	·16
Magnesia (Mg O)	·20
Potash (K_2O)	·53
Soda (Na_2O)	·25
Sulphuric acid (SO_3)	·04
Phosphoric acid (P_2O_5)	·02
Carbonic acid (CO_2)	·00
Organic matter and water (H_2O)	4·23
	100·00
Available P_2O_2	·0049
Available K_2O_2	·0031
Organic carbon	·98
Organic nitrogen	·092

6. *Manurial experiment.* -This, as mentioned in last year's report, has been designed to compare the results of—

(*a*) Different quantities of cattle manure applied before transplanting.
(*b*) The effect of adding phosphoric acid and potassic manures to a common dose of cattle manure.
(*c*) The use of artificials and oilcakes as a substitute for cattle manure.
(*d*) The effect of lime as a manure for paddy on Hmawbi soil.

The results of this year's manurial trials are as follows:—

STATEMENT I.—*Manurial experiment with paddy.*

No. of plot.	Manures applied.	1912-13 (unmanured). Yield in lbs.		1913-14 (manured). Yield in lbs.		Remarks.
		Straw.	Grain.	Straw.	Grain.	
1	C. M. to supply 30 lbs. N. per acre ..	284	215	237	197	C. M. = Cattle Manure.
2	C. M. to supply 50 lbs. N. per acre ..	305	228	202	196	
3	C. M. to supply 70 lbs. N. per acre ...	294	245	275	202	
4	Cotton cake to supply 50 lbs. N. per acre.	269	236	269	204	

STATEMENT I.—*Manurial experiment with paddy*—concluded.

No. of plot.	Manures applied.	1912-13 (unmanured). Yield in lbs.		1913-14 (manured). Yield in lbs.		Remarks.
		Straw.	Grain.	Straw.	Grain.	
5	C. M. to supply 30 lbs. N. per acre ... Superphosphate to supply 20 lbs. P_2O_5. Potassium sulphate to supply 20 lbs K_2O.	331	237	288	221	The season of 1913-14 was markedly inferior to that of the previous year, hence the smaller yields got.
6	C. M. to supply 30 lbs. N. per acre ... Superphosphate to supply 20 lbs. P_2O_5.	306	246	280	189	
7	Bonemeal (20 lbs. P_2O_5) and C M. to supply 30 lbs.	288	236	274	190	
8	Bonemeal to supply 20 lbs. P_2O_5.	275	246	206	174	
9	Superphosphate to supply 20 lbs. P_2O_5.	288	258	259	166	
10	Potassium sulphate to supply 20 lbs. K_2O.	314	241	264	176	
11	Sodium nitrate to supply 30 lbs. N.	317	220	224	148	
12	Sodium nitrate to supply 30 lbs. N. (topdressing).	296	233	237	165	
13	Nitrolium to supply 30 lbs. N. ...	297	238	300	195	
14	Ammonium sulphate to supply 30 lbs. N.	298	259	302	205	
15	Lime at 2,000 lbs. per acre ...	365	266	288	196	
16	Ammonium sulphate at 30 lbs. N. per acre. Superphosphate at 20 lbs. P_2O_5 .. Potassium sulphate at 20 lbs. K_2O	343	250	277	184	

During the season 1912-13, 80 small plots of ·09 of an acre each were constructed with their greatest length at right angles to the flow of water in order to secure uniformity of water supply.

In the same year all the plots were cropped with one variety of paddy without any manure and the yields of grain and straw taken. As a result of this comparison a block of 17 plots which showed the greatest uniformity was chosen on which to conduct the experiment. On this block the standard deviation from the mean yield of grain was 8 per cent. of the mean. Consequently I consider that in comparing results of manurial treatment a soil variation error of 24 per cent. should be allowed for during this year.

During the present year the 56 plots not manured gave a mean grain yield of 142 lbs. The mean of these plots in 1912-13 was 193 lbs. The mean of the 17 plots manured in 1913-14 was 239 lbs. in 1912-13. Hence we must make a seasonal correction and conclude that the mean of the 17 plots had they been unmanured in 1913-14 would have been $\frac{239 \times 142}{193}$ or 175 lbs. The critical range is accordingly 175=24 per cent. =134 to 216 lbs.

and only results outside of this range can be regarded as of significance at present. Hence only plot 5 can be considered to have shown a certain reaction to the manure applied.

Plot 5 { Cattle manure to supply 30 lbs. N per acre.
Superphosphate to supply 20 lbs. P_2O_5 per acre.
Potassium sulphate to supply 20 lbs. K_2O per acre.

That this dressing should have had a marked effect is quite in accordance with the analysis of the Agricultural Chemist. Ammoniacal nitrogen has been supplied by the cattle manure and the superphosphate and potassium sulphate have apparently met the deficiencies of the soil in P_2O_5 and K_2O remarked on by the Agricultural Chemist in his report.

In the case of the plots receiving nitrate of soda the results of the manure were apparent in the bleached and unhealthy appearance of the plants.

These experiments are being continued for a number of years and a duplicate set in plots is also being arranged. It is as yet too early to lay much stress on the results got.

An attempt was made to grow green manure on these soils but without success. If sown in the early rains the plants get drowned out and if sown among the standing paddy just before harvest they develop very poorly and do not afford a sufficient bulk of green material for ploughing in. Crotolaria Dhaincha and Indigo were tried and next year further trials will be made with other legumes.

7. *Transplanting experiment.*—This was undertaken last year with one variety and the result arrived at was that on Hmawbi soil a rapid decrease in yield may be expected if a planting distance greater than 6″ is adopted. In order to get clearer results the experiment was remodelled and conducted during the past season with two varieties (1) Ngasein a fairly strong tillering variety and (2 Ngachima a variety which tillers to a lesser extent. Five planting distances were taken, *viz.*, 4″, 6″, 8″, 10″ and 12″ and in each case four different methods of planting were used, *viz.*, one, two, three and four plants per clump. The transplanting was done in long narrow strips planted in rows and in each case only the middle row was harvested and the yield of straw and grain calculated per plant in each case. The yields per plant so got were then reduced to yields per 1,000 square feet in each case, the latter area being chosen to facilitate calculation.

The results for the two varieties are shown in the two statements **A** and **B** and underneath:—

A.—VARIETY—*Ngasein.*

1	2	3	4	5		6		7	8
Number of plants per clump.	Planting distance.	Average number of heads per clump.	Average tillering per clump.	Average yield per clump (lbs.)		Yield in lbs. on area of 1,44,000″		Mean yield (grain) for each planting distance.	Remarks
				Straw.	Grain.	Straw.	Grain.		
1	4″	2·86	1·86	·020	·012	180	108	119	This was slightly attached by crabs.
2		3·18	1·18	·020	·013	180	117		
3		3·18	·18	·022	·014	198	126		
4		3·84	—·16	·023	·014	207	126		
1	6″	3·70	2·70	·035	·022	140	98	82	
2		4·04	2·04	·025	·018	100	72		
3		4·55	1·55	·030	·020	120	80		
4		5·62	1·62	·023	·020	92	80		
1	8″	5·18	4·18	·028	·028	56	63	58	
2		4·7	2·7	·027	·021	60	47		
3		5·79	2·79	·038	·027	85	60		
4		6·09	2·69	·041	·028	92	63		
1	10″	5·06	5·06	·034	·031	49	45	65	
2		4·66	4·66	·064	·050	92	85		
3		5·4	5·34	·058	·041	84	59		
4		5·29	5·29	·062	·049	89	70		
1	12″	9·46	8·46	·055	·052	55	52	48	
2		9·72	7·72	·041	·032	41	2		
3		9·50	6·50	·054	·049	54	49		
4		11·04	7·04	·088	·061	88	61		

B.—VARIETY—*Ngachima*.

1	2	3	4	5		6		7	8
Number of plants per clump.	Planting distance.	Average number of heads per clump.	Average tillering per clump.	Average yield per clump (lbs.)		Yield in lbs. on area of 1,44,000."		Mean yield (grain) for each planting distance.	Remarks.
				Straw.	Grain.	Straw.	Grain.		
1	4"	1·70	·70	·015	·013	135	117	88	
2		2·16	·16	·014	·009	126	81		
3		2·77	·43	·016	·010	144	90		
4		3·66	·34	·021	·007	189	63		
1	6"	2·37	1·37	·022	·023	88	92	75	
2		2·83	·83	·020	·016	80	64		
3		3·55	·55	·024	·019	96	76		
4		4·15	·15	·023	·017	92	68		
1	8"	2·82	1·82	·022	·021	49	47	53	
2		3·27	1·27	·022	·020	49	45		
3		4·76	1·76	·032	·027	72	61		
4		4·89	·89	·031	·026	70	58		
1	10"	3·09	2·09	·030	·031	43	45	53	
2		4 53	2·53	·037	·033	54	47		
3		5·22	2·22	·046	·046	64	66		
4		6·36	2·36	·044	·038	63	55		
1	12"	3·88	2·88	·028	·025	28	25	23	
2		5·29	3·29	·028	·027	28	27		
3		7·02	3·02	·038	·037	38	37		
4		6·95	2·95	·042	·045	42	45		

In interpreting the result the first obvious point which strikes us is the corroboration of last year's result with regard to the planting distance. This is seen by an examination of the figures in column 7. There is marked decline in the yield as soon as that exceeds 6".

The evidence for single planting is not so clear. Columns 3 and 4 throw some interesting light on the nature of the development of the paddy plant. In column 3 are entered the average number of heads, as counted at harvest. This number, *minus* the number of transplants used, obviously gives the tillering or total number of secondary stems which have developed during the growth of the plant. Column 4 shows that this tillering increases continuously as the planting distances increases. If we consider each planting distance separately however, we see that the tillering, in the case of close planting at 4" and 6" is less when three and four transplants are used than when only one is used. In the case of 4" planting in both varieties there is actually *minus* tillering when three and four transplants were used, which means that fewer heads were harvested than transplants used, or in other words that some of the latter did not come to bearing, owing to want of space for development. In the case of wider planting distances, however, we see that when three and four transplants are used the tillering is equal to or greater than the tillering when only one transplant is used, a result, of course, of the greater space allowed.

The results with regard to the number of transplants used seem to show on the whole that with close planting distances it is apparently preferable to use only one transplant but that when greater distances are chosen 3 or 4 may be used with advantage.

The conclusions arrived at on this question by means of these experiments and by other observations on the station may be summarized as follows:—

(*a*) Tillering, or the power of secondary stem development depends on two sets of factors, the first a constant and inherited set (as shown in the case of the two varieties used in this experiment) and the second set the result of planting distance and soil fertility conditions. In the case of infertile soil plants may not tiller at all, no matter how wide the planting distance given. This was well demonstrated in the case of several fields at Hmawbi last year, where no secondary growth at all took place. Tillering is also hindered by unseasonable transplanting, notably so if the latter is done too late.

(*b*) Hence the planting distance used must be a function both of the tillering power of the variety used and of the fertility of the soil but depends mainly on the latter. It should accordingly be determined for each class of soil met with.

(*c*) That on the Hmawbi soil and on similar soil in Lower Burma the most economical method of transplanting is to use single planting and a planting distance of 4 to 6 inches.

8. *Varietal selection.*—This work was explained in last year's report. A collection of 200 types of rice was obtained from Lower Burma districts in 1912 and is maintained as a permanent feature of the work of the station and for purposes of selection from time to time. Many of the varieties were obvious mixtures and on separation of these last year the original total of 200 has risen to about 330. Pure cultures of these have been arranged and classified according to grain shape and colour and life period. Several of these cultures turned out to be the offspring of hybrid plants. Last year a very promising Ngasein from Myaungmya was isolated and is being propagated with a view to distribution.

A detailed examination of these cultures was made by the district agriculturists under training last year and the results entered on forms prepared for the purpose. In these forms the principal botanical characters and the life-period were noted. These forms have been handed over to the Assistant Botanist for revision during the present season and for the preparation of a written classification at the end of the year.

9. *Intra-varietal selection.*—This work, as mentioned in last year's report, was begun in 1912 by sowing out 1,000 plants of six types approved by millers and largely used by cultivators. Among the 1,000 plants those showing a marked superiority were first of all isolated. Then about one plant in every ten was selected along the lines at random and a seed of each of these also harvested separately. The seed of all these selected plants was sown out in rows during the year under report and each row examined for purity. The characters to which attention were directed were the following:—

Stem colour.
Colour of the ligulur band.
Colour of the stigma.
Colour of the apiculus of the glume.
Colour of the grain.
Colour of the glumes.
Presence or absence of awns.
Shape and colour of the seed.

This information was noted down for each of the 440 cultures grown in special forms kept by the assistants and district agriculturists under training.

Finally the total plant weight, straw weight, and grain weight were taken and also noted and the grain straw ratio calculated.

These observations have given some very interesting results but in a report of this kind it is not possible to give more than a summary. It is hoped, however, to publish full details later which will give all the points of most importance in connection with the principles to be observed in selection-improvement with rice.

The following are a few of the points noted:—

(i) In the case of the apparently best individual plants selected as parents in 1912 some of the plants owed their apparent superiority to their being hybrids resulting from crosses in the field in the previous year, and showing the well-known phenomenon of the increased vigour of the first hybrid. In other cases the selected parents bred true and maintained their superiority of yield in the next year. Such have been finally selected for yield. In other cases the selected parents bred true but did not maintain their superiority, their vigorous appearance in 1912 being apparently due to some advantage of soil or water supply in the nursery and the transplanted field. Hence it would appear that this method of selection has something to be said for it if a beginning of the work has to be made from a sample of seed. A year, however, is saved if it is possible to make a large initial selection of ears from the cultivators' fields. This latter method will be employed in future.

(ii) A very large variation in the yielding power of the lines was encountered but, except in the case of the above mentioned parents specially selected for appearance in 1912, it is not possible to say, until the soil variation error for such cultures has been worked out, how far these differences are independent of soil and water conditions and how far they may be really constant inherited characters. The best, however, have been selected, and the soil variation error, possible of estimation only when a sufficiency of a single pure line culture has been obtained, will be worked out during the present year.

(iii) The ratio $\frac{\text{grain}}{\text{straw}}$ was calculated for all the 440 cultures. It was found to fluctuate between ·790 to such high values as 2·581 and 2·098. The mean or average of all the values was 1·161 and the mode or most frequently occurring value was 1·175. Exceptionally high values were obtained in four cultures as follows:—

Ngasein-du-me	...	...	...	...	1·657
Ngaseingyi	...	...	...	...	1·811
Ngasein-du-me	...	...	..	..	2·098
Nga-kyauk	...	...	..	...	2·581

All these cultures have been selected on account of this character.

(iv) In general, that is statistically speaking, there is a marked correlation between total plant weight and grain weight and between total grain weight and straw weight. The

correlation coefficient by Pearson's method was worked out between total plant weight and total grain weight for the 440 cultures and was found to be + 0·91 with a probable error of + ·006. This is even higher than the + 0·8 got last year from the smaller set of figures derived from the manurial plots. From this it would appear that in general high yields of grain are associated with high yields of straw but that exceptions may occur as shown above and that if the selection of such exceptions is the object of the work the labour of the separate estimation of straw and grain must be undertaken. On the other hand if high yielding grain capacity without reference to straw yield is the object of the work it will be sufficient to take total plant weight only. This will save an enormous amount of time and labour.

It would appear that variations in the ratio between grain weight and straw weight are associated with the size of the leaf and the height of the flowering stem. This character, however, which has much the same significance in a cereal crop, as 'ginning percentage' has in cotton wants a good deal of further study to be properly understood.

(v). Considerable difference was found between the cultures belonging to the same variety in the number of days that elapsed between the appearance of the first flower and the final flowering of the row. This point has an important bearing on the question of uniformity in ripening and will receive careful study in future.

(vi) On the whole the cultures derived from one cultivator's field were uniform in the length of their total life period but a few exceptions occurred in which differences of 9 or 10 days were observed. These differences, except in one or two cases where lateness of ripening was accompanied by a difference in morphological characters, are probably due to difference in the fertility of the soil or to differences in the water supply of the nursery.

(vii) The purity of cultivators' varieties was shown to vary greatly. In two of the varieties no visible errant plants or hybrids were encountered while in one variety—Ngasein—35 of the 93 cultures examined were impure. The other varieties showed impurity in a varying degree.

(viii) Of the 400 lines grown, a final selection of 40 cultures has been made. These will be grown during the present year in order to see how far the characters for which they have been selected remain constant and it is hoped that seed of the best will be available for stocking the seed farms in 1916.

The above selection work forms a permanent feature of the work of the station and the staff and district agriculturists have been trained to undertake it.

Selection on similar lines will be begun during the present year with the following cultivators' varieties:—

Dalisan.	Byat-thi-dat.
Bilugyun Ngasein.	Kalagyi.

Myaungmya Ngasein.

10. *Cross-fertilization in the rice plant.*—During the last two years tests were made, using red grained paddy as an index, to discover whether cross-fertilization was at all common in cultivated rice. The evidence of different observers is at variance on this point. It has been affirmed as a fact by some and denied by others and it probably depends a good deal on the local climatic conditions. The practical importance of the matter in connection with rice improvement was explained in last year's report and need not be gone into again.

The experiments in 1912 proved conclusively that in the varieties used cross-fertilization took place to some extent, probably about 1 in 1,000 of the flowers of the crop receiving alien pollen. Incidentally it was shown that red grain is a mendelian dominant to white, red splitting cultures giving reds: white in the proportion of 3:1.

Work on similar lines was carried on during 1913 with a variety of Ngasein from Tavoy and a variety called Kalagale from Ma-ubin. In these varieties red and white plants were known to be growing together in cultivators' fields and the ears were separated out and sown separately. The results were as follows:—

Tavoy Ngasein.—In a total of 3,225 plants from white sowings two red plants were found. In the cultures derived from red sowings 13 cultures split up giving a total of red to white of 232 to 94 on a red: white ratio of 2·46: 1.

Kalagale (Ma-ubin).—In a total of 3,893 plants derived from white sowings 62 red plants were found. Of the red cultures 12 split giving a total of 304 red plants to 87 white or a red: white ratio of 3·49: 1.

The figures so far as the mendelian ratios go are not so good as got last year when considered separately. The average, however, is 2·97: 1 which clearly indicates a 3: 1 ratio and corroborates last year's results.

These figures, coupled with the observations made in the selection plots during the present year prove beyond all doubt the fact of cross-fertilization in Burma rice. The question still unsettled is the quantitative aspect.

Clearly if a crop contains originally 50 per cent. red and 50 per cent. white, the crossing factor will be greater than if only 5 per cent. red has been present. We must devise a

means of estimation which shall as far as possible be independent of the relative proportions of the crop constituents.

Until such estimation has been made we are still very much in the dark as to the extent of the phenomenon and the necessity for circumventing it in selection work.

An experiment has been planned for the present year which it is hoped will finally settle the question.

11. *Implements.*—Owing to absence of building accommodation it has not been possible so far to make efficient tests with implements for the speedier and more economical handling of the rice crop. The Corbett Winnower, however, has proved very satisfactory. Next year the reaping machine and thrashing machine, will be thoroughly tested and the results embodied in the annual report.

12. *Statement showing expenditure of the Agricultural Station, Hmawbi, for the year from 1st July 1913 to 30th June 1914.*

A.—EXPENDITURE.

—	Amount.	Total.
Supplies and Services.	Rs. A. P.	Rs. A. P.
Wages of farm maistries and coolies	5,149 11 2	
Feed and upkeep of live stock	97 15 6	
Purchase of seed and fruit trees	90 14 6	
Upkeep of garden, fencing and trenching	2,474 12 11	
Purchase of live stock and agricultural implements	2,519 10 0	
Acquisition of land	.....	10,333 0 1
Contingencies.		
Service postage and telegram charges	5 13 6	
Purchase of furniture	.....	
Freight, shipping and landing charges	80 13 6	
Purchase of books and periodicals	.....	
Office expenses and miscellaneous	602 3 0	
Rents, rates and taxes	42 4 0	791 2 0
GRAND TOTAL ...	...	11,124 2 1

B.—RECEIPTS.

The sum of Rs. 2,579-5-7 was obtained from sales of paddy during the year.

Four hundred and sixty-five baskets valued at Rs. 581-4-0 were retained for seed and selection purposes.

The decrease in the amount of receipts as compared with that of the previous year was due to the less favourable character of the season, to the much lower price received for the crop, and to a larger area being under experiment.

The average price received in 1913-14 was only Rs. 120 as compared with an average of Rs. 135 in 1912-13.

The total yield fell from 3,413 baskets in 1912-13 to 2,573 baskets in 1913-14.

A. McKERRAL,
Deputy Director of Agriculture,
Southern Circle, Burma.

INSEIN, *21st July* 1914.

APPENDIX III.

List of Implements sold from Implement Depôt, Mandalay Agricultural Station.

Serial No.	Name of Implements.	District.	Number distributed.				Value.
			To experimental stations.	To societies.	To individuals.	Total.	
1	2	3	4	5	6	7	8
							Rs. A. P.
1	*Gwinsets* or grass cutting *htun* ...	Kyauksè ...	...	...	4	4	106 0 0
2	*Gwinsets* or grass cutting *htun* ...	Mandalay ...	...	...	6	6	159 0 0
3	*Gwinsets* or grass cutting *htun* ...	Myitkyina ...	...	...	2	2	52 0 0
4	*Gwinsets* and extra teeth ...	Shwebo ...	...	...	2	2	56 0 0
5	" Beeloo " plough	Mônywa ...	...	...	1	1	26 0 0
6	" Beeloo " plough	Myitkyina ...	...	...	1	1	26 0 0
7	" Beeloo " plough and shares ...	Sagaing ...	...	...	1	1	42 0 0
8	Chain pump (hand)	Kyauksè ...	...	...	1	1	60 0 0
9	Chain pumps (hand)	Mandalay ...	...	...	4	4	250 0 0
10	Chain pump (hand)	Sagaing ...	...	...	1	1	75 0 0
11	Chain pump (hand)	Mônywa ...	...	..	1	1	72 0 0
12	Chain pump (hand)	Myingyan ...	...	...	1	1	87 0 0
13	Chain pump with gear (bullock) ...	Kindat ...	...	...	1	1	208 4 0
14	Chain pumps with gears (bullock) ...	Katha ...	...	2	...	2	444 0 0
15	Bullock gear	Mandalay ...	...	...	1	1	125 0 0
16	Cyprus ploughs	Mandalay ...	14	...	...	14	363 0 0
17	Cyprus ploughs	Sagaing ...	2	...	3	5	129 12 0
18	Cyprus plough	Myitkyina ...	1	...	...	1	26 0 0
19	Cyprus ploughs	Rangoon ...	2	...	...	2	52 0 0
20	Cyprus plough	Southern Shan States.	...	...	1	1	26 0 0
21	Cyprus plough and extra share ...	Mônywa ...	...	...	1	1	27 8 0
22	Winnowing machines	Mandalay ...	...	...	5	5	650 0 0
23	Winnowing machine	Sagaing ...	1	...	...	1	125 0 0
24	Winnowing machine	Myingyan ...	...	...	1	1	125 0 0
25	Raja Chaff cutters	Kyauksè ...	...	...	5	5	230 0 0
26	Raja Chaff cutters	Mandalay ...	1	...	12	13	598 0 0
27	Raja Chaff cutter	Shwebo ...	1	...	...	1	46 0 0
28	Raja Chaff cutter	Myingyan ...	...	...	1	1	46 0 0
	Total ...	.....	...	...	...	...	4,232 8 0

G. B. C. P. O.—No. 33 & 38, D. of A., 30-11-1914—520—Leo. N.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ended the 30th June 1915

RANGOON

OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, BURMA

1915

LIST OF AGENTS

FOR THE

SALE OF GOVERNMENT PUBLICATIONS.

IN INDIA:

THACKER, SPINK & Co., Calcutta and Simla.
W. NEWMAN & Co., Calcutta.
THACKER & Co., Ltd., Bombay.
HIGGINBOTHAM & Co., Madras.
SUPERINTENDENT, AMERICAN BAPTIST MISSION PRESS, Rangoon.
* D. B. TARAPOREVALA SONS & Co., 103, Medows Street, Fort, Bombay.
BUTTERWORTH & Co. (India), Ltd., 8-2, Hastings Street, Calcutta.

IN ENGLAND:

HENRY S. KING & Co., 65, Cornhill, E. C.
A. CONSTABLE & Co., 10, Orange Street, Leicester Square, W.C.
KEGAN PAUL, TRENCH, TRÜBNER & Co., Ltd., 68—74, Carter Lane, E.C., and 25, Museum Street, W.C.
BERNARD QUARITCH, 11, Grafton Street, New Bond Street, W.
P. S. KING & SON, 2 & 4, Great Smith Street, Westminster, S.W.
GRINDLAY & Co., 54, Parliament Street, S.W.
T. FISHER UNWIN, 1, Adelphi Terrace, W.C.
W. THACKER & Co., 2, Creed Lane, Ludgate Hill, E.C.
LUZAC & Co., 46, Great Russell Street, W. C.
OLIVER & BOYD, Tweeddale Court, Edinburgh.
E. PONSONBY, Ltd., 116, Grafton Street, Dublin.
B. H. BLACKWELL, 50 & 51, Broad Street, Oxford.
DEIGHTON, BELL & Co., Ltd., Trinity Street, Cambridge.

ON THE CONTINENT:

ERNEST LEROUX, 28, Rue Bonaparte, Paris, France.
MARTINUS NIJHOFF, The Hague, Holland.

---

* For the sale of official publications excluding those of the Legislative Department of the Government of Burma.

[The maximum limit of the body of the Report is 12 pages.]

TABLE OF CONTENTS.

REPORT ON THE OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA FOR THE YEAR ENDED THE 30TH JUNE 1915.

CHAPTER I.—ADMINISTRATION.

PARA.		PAGE
1.	Personal	1
2.	Tours	*ib.*
3.	Staff	*ib.*

CHAPTER II.—AGRICULTURAL EDUCATION.

4.	Agricultural Education	2
5.	School Gardens	*ib.*

CHAPTER III.—AGRICULTURAL RESEARCH AND EXPERIMENT.

6.	The Deputy Director, Northern Circle	2
7.	The Deputy Director, Southern Circle	3
8.	Agricultural Stations	*ib.*
9.	Experimental Gardens	*ib.*
10.	Experiments through district agency	*ib.*
11.	Paddy	4
12.	Cotton	*ib.*
13.	Sessamum	5
14.	Sugar-cane	*ib.*
15.	Jowar	*ib.*
16.	Wheat and gram	*ib.*
17.	Tobacco	6
18.	Pulse crops	*ib.*
19.	Miscellaneous	*ib.*
20.	Chemistry	*ib.*
21.	Botany	7
22.	Entomology	*ib.*

CHAPTER IV.—DEMONSTRATION, ETC.

23.	District Agriculturists	7
24.	Seed Farms	8
25.	Shows	*ib.*
26.	General Progress	*ib.*

CHAPTER V.—AGRICULTURAL ENGINEERING.

27.		*ib.*

CHAPTER VI.—PUBLICATIONS AND SUPPLY OF INFORMATION.

28.	Publications	9
29.	Supply of information	*ib.*

CHAPTER VII.—MISCELLANEOUS.

30.	Poultry breeding	9
31.	Departmental Conferences	*ib.*
32.	Conclusion	*ib.*

From P. C. FOGARTY, Esq, I.C.S., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 342C.—5R.-81, dated the 6th October 1915.

I am directed to submit, in proof, three copies of the Report by the Director of Agriculture, on the operations of the Department of Agriculture, Burma, for the year ending the 30th June 1915.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE BURMA

For the year ended the 30th June 1915.

CHAPTER I.

ADMINISTRATION.

1. The post of Director of Agriculture was held by me throughout the year.

Personal.

Mr. J. A. Stewart, I.C.S., was on special duty in the Agricultural and Co-operative Departments from the commencement of the year up to the 8th May 1915. His time was, however, mainly occupied in co-operative work.

In addition to my duty as Director I was also Joint-Registrar of Co-operative Societies, and during the absence of Mr. A. E. English, the permanent Registrar, on leave and subsequently on deputation, was responsible for the policy of the Co-operative Department. Approximately three-quarters of my time and nearly all my tours during the year were devoted to co-operation. The result is that except for general administrative control of the Department and inspections of the various experimental stations now open in the Province, I have done but little agricultural work. I do not think that this has been a disadvantage. Greater responsibility has devolved upon the Superior Staff, which is certainly not to be regretted, while the half-yearly Departmental Conferences of the Department have increased in importance. All new schemes and new developments of existing work are there considered before being finally adopted. The programmes of the several experts have for some time been annually discussed at the Conferences and arrangements have now been made for all annual reports also to come before them. A proper co-ordination between the work of all branches is thus readily secured and considerable relief has been afforded to the Director as controlling officer, who without the assistance of these Conferences would have found his double duties almost beyond his powers.

2. During the year 242 days were spent on tour and visits were paid to the following districts—Katha, Shwebo, Sagaing, Lower Chindwin, Mandalay, Myitkyina, Kyauksè, Meiktila, Pakôkku, Myingyan, Yamèthin, Toungoo, Insein, and Rangoon Town. All the experimental stations and seed farms of the Department were inspected except that at Pwinbyu in the Minbu District. Most of the tours as already explained were primarily connected with co-operative work, but agricultural matters were not neglected and a considerable amount of valuable information as to local agricultural conditions was obtained in the course of them.

Tours.

3. The Superior Staff of the Department remained unchanged throughout the year. The appointment of a third Deputy Director has been sanctioned, but it is not proposed to provide funds for it until the conclusion of the war.

Staff.

Both Mr. Thompstone, Deputy Director of Agriculture, Northern Circle, and Mr. Warth, Agricultural Chemist, availed themselves of one month's privilege leave during the year. With regard to the subordinate staff the temporary Superintendent for the Hmawbi Farm has been sanctioned for a further period up to the 26th September 1915, and an increase of three has been made in the number of district agriculturists.

CHAPTER II.

AGRICULTURAL EDUCATION.

Agricultural Education.

4. The main work of the Department in connection with agricultural education was, as in former years, the training of recently recruited members of the Subordinate Staff. The five probationary assistants sanctioned in 1914 were under training throughout the year; five district agriculturists have been posted to districts on the completion of their course and three district agriculturists have commenced their training at Hmawbi.

So far as the general public is concerned little or nothing is at present done to provide instruction in scientific agriculture, and there would appear to be little or no demand for such instruction. For young men desiring to devote themselves to the life of a farmer on leaving school or college, the best possible training would seem to be a course of practical agriculture on one of the Department's experimental stations, which would probably be of greater practical value than the more theoretical training to be obtained at regular agricultural colleges.

The student would be required to meet his own expenses, but these would not be large. No applications to undergo such training have been received during the year, but I shall be glad to consider them when they are forthcoming.

Five cultivators availed themselves during the season 1914-15 of the stipends offered by the Department to members of Co-operative Societies desiring to gain experience of the methods in use on the experimental farms particularly in regard to seed selection. No attempt has been made to tout for students as such action is likely to produce men whose only object is to obtain permanent employment with the Department. The existence of the stipends is however becoming better known and there has been a considerable increase in the number of applications for them in the current season. The main object of these stipends is that the cultivators enjoying them should at the conclusion of their course be encouraged to undertake the propagation of the improved seed produced by the Department, and I am glad to say that this object appears likely to be realized in a fair number of cases.

School Gardens.

5. The Department has had little or nothing to do with School Gardens during the year and these remain under the Education Department. A quantity of vegetable seeds was however distributed. Mr. Thompstone, Deputy Director of Agriculture, Northern Circle, has under preparation a book of simple lessons on plant life and agricultural matters generally, suitable for use of teachers in primary schools which it is hoped may facilitate the development of nature study and object lessons in these institutions.

CHAPTER III.

AGRICULTURAL RESEARCH AND EXPERIMENT.

The Deputy Director of Agriculture, Northern Circle. (MR. E. THOMPSTONE.)

6. Mr. E. Thompstone, B.Sc., Deputy Director of Agriculture, was in charge of the Northern Circle throughout the year. He has now under his charge five experimental stations at Mandalay, Padu, Hopin, Bugyi and Yawnghwe, the last named a new station opened at the close of the year, and his work for the twelve months has been mainly confined to the supervision of the experimental work in progress upon them. This experimental work is fully described in the reports of the first four stations which are separately published and will be also commented on under the headings of the various crops dealt with later in this chapter. In addition to these duties Mr. Thompstone attended the Bhamo Agricultural Show. He also visited Maymyo at the request of the authorities of the Supply and Transport Department to advise on certain difficulties which have arisen with regard to the supply of fodder at that station.

Deputy Director of Agriculture, Southern Circle. (MR. A. McKERRAL.)

7. Mr. A. McKerral, B.Sc., Deputy Director of Agriculture, continued to take charge of the Southern Circle throughout the year. He has under him the experimental stations of Hmawbi, Tatkon and Pwinbyu, and their supervision occupied most of his time. Tatkon was visited monthly and Pwinbyu quarterly during the period under report. In addition a seed farm has been opened at Yedashe in the charge of the district agriculturist of the Toungoo District. The experimental work carried out on the above stations as in the case of those in the Northern Circle will be found described at length in the reports which are separately published and will also be alluded to under the head of the various crops dealt with in the course of the present report.

Agricultural Stations.

8. The administration reports of the various experimental stations will be found in the appendices to this report. The buildings at the Hmawbi station were completed during the year but some work still remains to be done upon the roads. At Tatkon buildings of mat and thatch together with a machinery shed of corrugated iron were erected by the Public Works Department at a cost of Rs. 11,000. A well is still badly wanted, as the time and money spent in carting water from a distance can ill be spared. A good supply of surface water is obtainable at a depth of 45 feet, but owing to lack of funds, no well has yet been dug. In the Northern Circle the Padu and Hopin stations have been provided with mat and thatch buildings at a minimum of cost. Proposals have been submitted for the expansion of the work at Hopin by the diversion to it of the sum hitherto allocated to the Government garden at Myitkyina. No orders had however been received at the end of the year. At Mandalay the construction of a much needed manure pit was undertaken, and electric light and fans were provided for the laboratory, offices and residences of the Superior Staff.

The chief desideratum remaining to be supplied is a proper drainage system for the farm buildings and houses of the subordinate staff. This depends however on the completion of the Mandalay main drain now under construction. At present the house sites after rain become a swamp and a good deal of illness has thereby been occasioned.

A new station was opened at Yawnghwe during the year, in the place of the old Government garden at Taunggyi. It is intended to be devoted to wheat and other crops of the Southern Shan States and the *Sawbwa* of Yawnghwe has provided an annual grant of Rs. 3,000 towards its upkeep.

The necessary buildings were erected during the period under report, but further sums are still required for the completion of its equipment.

Experimental Gardens.

9. Of the two experimental gardens still remaining under the control of district officers that at Falam had a fairly successful year, the sale of vegetables and fruit realizing Rs. 484-10-0, an excess of Rs. 98 over the previous year. Some young orange trees were procured departmentally from the Shan States but all failed. Steps are being taken to replace them by others from the Lushai Hills in the coming season. Californian fruit trees given by a local missionary did well and experiments with American cotton, coffee and groundnuts are in progress.

The Myitkyina garden made little progress and proposals have been submitted for its abolition. The staff of gardeners neglected their work and the outturns both of wheat and potatoes were very inferior.

The total expenditure under all heads for both gardens was Rs. 1,876 and the receipts totalled Rs. 514. The net cost to Government was therefore Rs. 1,362.

Experiments through district agency.

10. Experiments through district agency continued to be on a small scale and have been mainly confined to outlying parts of the Province. A tree felling and stump extracting apparatus has been imported at the instance of the Superintendent, Pakôkku Hill Tracts, for the complete felling and clearing of *taungya* areas. It has however still to be tested at Tatkon.

The Superintendent, Chin Hills, brought his small experiment in sugar-cane cultivation to an apparently successful issue, and it is possible that a useful addition to the crops grown by the Chins has been discovered. In the Myitkyina District the attention of the Department was drawn by the Deputy Commissioner to the indigenous tea cultivation of the nothern hill tracts and a grant of Rs. 300 has been made to enable the Assistant Superintendent at Htawgaw to undertake the care of a small existing plantation at that station. Further information as to the extent of this cultivation has been asked for.

Paddy.

11. Paddy is the most important crop of the Province and likely to remain so. To it are devoted the main energies of the principal experimental stations at Hmawbi and Mandalay. At Hmawbi ten pure strains of improved paddies, the result of three years' selection for yield and milling quality, have been produced on a field scale and are ready for distribution. Samples of these sent to the Burma Chamber of Commerce have been examined and favourably commented on. Some were stated to be of first class quality for export to Europe, while others are specially suited for export to India and for local purposes. Between four thousand and five thousand baskets of this improved seed will be available for distribution this year.

At Mandalay seed selection work continued on the same lines as in former years. In addition to the pure lines mentioned in last year's report a variety of *ngaseingyi* yielding 20 per cent. more than the ordinary local strains has been evolved and is now being produced on the seed farm of the station with a view to distribution to the public. Various planting, manurial, spacing and other experiments have been carried out, the results of which are full of interest. So far, however, as artificial manures are concerned it appears to be highly improbable that at present prices their use will result in any increased profits to the cultivator.

Cotton.

12. Work on cotton was undertaken both at Tatkon and Padu. At the former station a preliminary examination of Burma cotton has resulted in the obtaining of a large number of single plant selections which are being grown this year. Botanically speaking the crop shows three distinct types, a yellow flowered type, a white flowered type which occurs as a constituent in relatively small proportions, and a type obtained from samples received from the Shan States which shows marked red colouration of the stems and leaves and possesses a silkier fibre than the first two. Variations in ginning percentage were found from 25 per cent. to 40 per cent., and several single plant selections of specially high ginning percentage have been isolated both in the case of *wagyi* and *wagale* and are being cultivated. In the case of *wagale* the determinations of ginning percentage made up to date seem to indicate that the white flowered type has a higher ginning percentage than the yellow. The Shan States type showed the lowest ginning percentage.

Variation in staple length was also studied, but no definite results obtained. In no case was a staple length exceeding one inch observed and the average of the plants is $\frac{3}{4}$ inch or less.

In order to test the opinion of Mr. Arno Smith Pearce, Secretary of the International Federation of Master Cotton Spinners' and Manufacturers' Associations on Burma cotton expressed during his tour in Burma last year and mentioned in last year's report, arrangements were made for some samples of cotton to be picked by certain Co-operative Societies according to instructions prepared by Mr. McKerral. The cotton after ginning was sent to various firms for report. One of the most reliable reports received estimated the value of the sample at $4\frac{3}{4}d.$ with middling American at 5·68 and fine Bengal at $4\frac{5}{16}$ which goes far to confirm Mr. Smith Pearce's verdict. Considerable quantities of such cotton would be obtainable if a suitable premium were offered by the ginning firms to the cultivators, but no data are yet available as to the proportion which such cotton bears to the total product. Further enquiries with a view to the elucidation of this point will be undertaken during the coming year.

Cambodia cotton was grown at both stations but not with any great success. At Padu it grew luxuriantly and presented a splendid appearance, but as a result

of strong winds in October and subsequent insect attacks, many bolls dropped off. The remainder did not open freely and the yields were not good.

A word of warning is necessary against haphazard distribution of seed by ginning firms. A sample of cotton grown from seed so distributed was found to be a mixture of Cambodia and *wagyi*. Little benefit to the quality of the local crop can be expected to result from such action.

Sesamum.

13. Sesamum covers over a million acres in Burma and the opening of the Tatkon station has enabled work on this very important crop to be commenced. A collection of twelve varieties has been made with a view to obtaining some information regarding the number of plant types in the crop, and Deputy Commissioners have been asked to procure small samples of all the varieties known in their districts. The different types will then be isolated and purified. It is obvious from the samples already received that the crop is a very mixed one. The pure types when obtained will be compared for earliness, yield, immunity to the attack known as "green flower" (Burmese ဖြူဖတ်) and lastly and chiefly for oil content.

Sugar-cane.

14. Sugar-canes have been imported into the Mon Canal area, Minbu District, by the Department from Pyinmana and from the Sugar-cane Expert to the Government of India. The latter were destroyed by a flood, but the Pyinmana canes were grown under irrigation on a field scale at the Pwinbyu station and a very satisfactory yield of about 30 tons of stripped cane to the acre was obtained. The plants seemed free from disease though white ants did some damage to the sets.

Jaggery boiling tests showed about 12 per cent. of the stripped cane weight to be recoverable as jaggery. Most of the crop was sold as seed to co-operators and about forty acres have now been planted up by the latter. The crop should for the present find a market as chewing cane in the riverine towns, but if cultivation extends, it will be necessary to introduce crushing and boiling plant preferably on a co-operative basis. Should funds be available, it would be desirable that in the first instance the experiments with this plant should be undertaken by Government. Owing to the war no further progress has been made with the proposal for a capitalist sugar-cane factory mentioned in last year's report.

Jowar (Sorghum Vulgare).

15. A careful examination of locally grown jowar has proved this crop to be a perfect medley of types, more mixed than perhaps any other crop in the country. A large number of single plant selections have been made at Tatkon and are being sown out this season. It is possible that these types when cultivated separately may show very different yielding values and it may be hoped that some may be more resistant to the *Striga Lutea* pest than others. Work on the *Striga Lutea* is also progressing on the Mandalay station, but no definite results suitable for publication have as yet been secured.

Wheat and Gram.

16. Experimental work with wheat has been conducted both at the Padu and at the Hopin stations. Padu is confined to macaroni wheat (Triticum durum) and here 16 pure lines originally obtained at Mandalay were grown for comparison, the best of these giving an outturn exceeding that of the ordinary local variety grown in an adjoining plot by 67 per cent. Similar increases over local outturns have been obtained in the case of certain imported strains of gram, already selected and tested in Mandalay, and work on both these crops is being continued.

At Hopin the season was very unfavourable and the results obtained from the experiments on bread wheats there conducted were not striking. The station has however only recently come under cultivation and an improvement may be expected next season. Wheat cultivation is said to be establishing itself round Myitkyina and if a reliable market is obtained may be expected to flourish.

A noteworthy feature of the year is the interest which has been aroused in wheat cultivation among the cultivators of the black cotton soil areas of the Shwebo District and of the low lying lands along the Mu where floods have

recently done much damage. The successful substitution of wheat for paddy over much of this area if it proves practicable will result in a considerably increased income to the cultivators.

Tobacco.

17. It has again been found impossible to undertake any work in connection with tobacco for which the soil of the existing farms is generally unsuitable. A special station will ultimately be required to deal with this crop. In the meantime it has been arranged to commence some preliminary work on a plot in the farm enclosure at Hmawbi, and proposals have been submitted for the recruitment of an extra Assistant who will be trained with special reference to this crop and thus be available to take charge of the special tobacco station when it is established. It is proposed to find the money by diverting the allotment at present devoted to the Bhamo Agricultural Show.

Pulse crops.

18. More attention has been given to pulse crops than in the past. The Cajanus Indicus (Burmese Peseinngon) grown on the Bugyi station has attracted the attention of local cultivators and all the seed available has been distributed. There is a good market for this crop and it seems likely to prove a useful addition to the upland crops of the Province.

Madagascar beans were again cultivated but the outturns obtained by cultivators were small. We have still much to learn about the best method of cultivating this crop and the soils most suited to it, but I have every reason to hope that before long it will be successfully established on a commercial scale in the Province.

At Natywagon near Mandalay where these beans have now been cultivated for three generations of seed, there has been a distinct deterioration in size together with a small but very noticeable rise in prussic acid content. The whole question of the prussic acid content of the beans of Burma is now under examination by the Agricultural Chemist; I am inclined to think that its importance has been greatly exaggerated. A curious incident of the year's experiments was that one plant in the plot was found to be yielding nothing but red seed which was also speckled and marked like that of common *pegya*. As no coloured beans were grown in the immediate neighbourhood, this result is somewhat remarkable.

Miscellaneous.

19. The Lower Burma Planters' Association asked for assistance during the year in dealing with the disease of rubber trees known as "black thread." Mr. Shaw, the Imperial Mycologist, kindly sent his assistant to conduct an enquiry into the matter and also visited Burma himself in June. The enquiry is still proceeding. The disease is regarded as a very serious matter by the Burma Planters and the thanks of the Department are due to Mr. Shaw for his ready response to my request for his assistance.

Experiments with castor are in progress on several of the experimental stations, and at Tatkon as the result of the comparison of a considerable number of varieties, indigenous and imported, three have been retained for distribution. These varieties are all impure and a good deal of selection work will probably be required in connection with this crop as also with maize which is likewise beginning to receive attention.

The war made it difficult for cultivators in the Kyauksè District to dispose of their castor crops and I fear that its cultivation may have experienced a temporary set back.

Chemistry.

20. Mr. F. J. Warth, M.Sc., Agricultural Chemist, was in charge of the Chemical Branch throughout the year. Three hundred and seventy-eight analyses were completed, this figure being exclusive of analyses and preliminary tests on the ripening of paddy, and on prussic acid and humus determinations. Two sheds of pot cultures for the comparison of different soils were put down, but in one case a bad attack of *gwabo* vitiated results. The second shed was kept free from infection and the results obtained are being prepared for publication. The field cultures undertaken included manurial tests, cultures for testing the effect of climate and watering on the ripening of paddy and environment experiments.

The chemical data obtained are not so far conclusive, and the experiments will be continued. In the case of the last named experiments however the figures appear distinctly to indicate that yields are to an appreciable extent dependent upon the selective effect of soils upon different paddy varieties. A large number of tests were carried out during the year to determine the relative liability to breakage of some paddy cultures. Great difference was found between the various cultures and experiments are now in progress to ascertain how far fragility is a characteristic of individual cultures and to determine the factors which affect it.

In connection with a systematic examination of the prussic acid content of Burma beans which has been commenced a full series of experiments to test methods and apparatus for carrying out the analytical work has been completed, an account of which will shortly be published. In addition to his other work Mr. Warth was in charge of the small experimental dairy at which the possibilities of the development of the indigenous dairying industry of the Sagaing District are being studied. Numerous data are being accumulated, but are not yet sufficiently conclusive for publication.

Botany.

21. The Botanical work of the Department is, as will have been gathered from the earlier paragraphs of this chapter, one of the most important of its present activities, especially in the direction of seed selection and plant breeding. The Assistant Botanists, Mr. A. M. Sawyer at Mandalay and Mr. R. Beale at Hmawbi, are the chief lieutenants of the Deputy Directors in the conduct of this work and as such their work is included in that already described. In addition to these duties Mr. Sawyer has continued the special enquiries into *Striga Lutea* and the water hyacinth (*Eichhornia Crassipes*). The results are not yet available for publication. Mr. Sawyer's work has been up to his usual standard of excellence and Mr. Beale has made a good beginning. With increasing experience and continued study he should become a very useful botanical assistant.

Entomology.

22. Mr. K. D. Shroff was Assistant Entomologist throughout the year and again did useful work. A large collection of general and economic insects was made in Mandalay and on tour of which over 240 species were sent to the Imperial Entomologist for identification. Other work done included the rearing of 38 important insect pests and the study of their life history, germination tests of seeds treated with carbon bisulphide and napthaline, and a study of the chief paddy pests of the Province. This latter task was greatly facilitated by much useful and interesting data kindly furnished by district officers.

The Imperial Entomologist visited Burma during the year and as a result of his visit, arrangements have been made for the maintenance of closer relations than have as yet existed between the entomological work carried on by the Department and that of the Imperial Research Institute at Pusa.

CHAPTER IV.

DEMONSTRATION, AID TO THE PUBLIC, SHOWS, AGRICULTURAL ASSOCIATIONS AND GENERAL PROGRESS.

District Agriculturists.

23. There are now ten district agriculturists at work in the districts of Shwebo, Mandalay, Kyauksè, Yamèthin, Myingyan, Pakôkku, Thayetmyo, Toungoo, Minbu and Insein. The Pegu man died during the year and a successor is under training, as also are three additional agriculturists destined for the Hanthawaddy, Prome and Tharrawaddy Districts. The results of the first year's work of the six men mentioned in last year's report has been very satisfactory. In Yamèthin orders for agricultural implements to the value of Rs. 1,843 have been received through the district agriculturist and in Insein 3 tons of bone-meal were ordered by cultivators as the result of the district agriculturist's demonstrations on

exhausted paddy land. In Shwebo the interest displayed in the expansion of wheat cultivation is largely due to the district agriculturist's efforts. There is no doubt that there is a very wide sphere of useful work open to these officers and the future may be looked forward to with some confidence. A number of implements were sold direct to cultivators by the Department and a list of those issued from the implement store of the Northern Circle at Mandalay is attached to this report. The value of implements distributed in the Southern Circle was Rs. 2,752. In addition arrangements have been made with Messrs. Cowie & Co. of Rangoon and Mandalay, to act as the retail agent of the Department and this firm is opening more commodious premises in Mandalay to enable it to develop this business.

Seed Farms.

24. Considerable development in district work is to be expected as the work of seed selection and plant breeding now in progress on the various experimental stations advances and pure lines of improved quality become available in sufficient quantities for distribution. Before accepting the Department's seed cultivators frequently evince desire to see the seed actually under cultivation. This is as it should be and would appear to indicate that seed farms in every district will be required. At present these have been sanctioned only for Pegu and Toungoo, and it is desirable to watch the results here obtained before establishing others.

Before the end of the year district agriculturists will be working in every district of the Pegu Division and also in Toungoo, and until a third Deputy Director is appointed, it will be impracticable for the work to be extended into other districts of the Lower Province. As it is, the proper control of the seed distribution arrangements in these six districts will involve a good deal of labour and it is proposed to place the assistant hitherto destined for the superintendence of the Hmawbi Station in charge of it in addition to the seed reproduction work at Hmawbi, while the experimental work at that station will be taken over by the Assistant Botanist. A good deal of the seed reproduction work has this year been handed over to the members of the Hmawbi Co-operative Credit Society, and it is hoped that before long this Society may be in a position to undertake practically the whole of this work.

Shows.

25. The proposals submitted last year for the discontinuance of the Bhamo Agricultural Show were not approved and in accordance with orders received an attempt was made to make the 1915 Show more attractive. These however produced no effect and I have again recommended its abolition. The Agri-Horticultural Society of Burma held its usual show and the Department prepared a special exhibit.

General Progress.

26. The proposals for the development of work of the Department sanctioned in 1913 have now been all carried into effect and the general results obtained are in my opinion on the whole satisfactory. These proposals were intended to cover a period of five years during which no new ventures involving additional expenditure would be undertaken. This principle has been adhered to and all modifications involving increased expenditure have been counterbalanced by reductions in directions where little progress is at present obtainable.

Further proposals will be submitted in due course for the quinquennium commencing in 1918 when it is hoped that a further expansion of the work of the Department will be found to be practicable.

CHAPTER V.

AGRICULTURAL ENGINEERING.

27. No advance has been made during the year in the subject of agricultural engineering, and it has hitherto been found impossible to give effect to the proposals mentioned in the last report for enabling agriculturists to gain an insight into the working and management of mechanical apparatus. The question of the

introduction of power machinery into the agriculture of the Province is however rapidly becoming of importance and a great deal of the time of the Deputy Directors, especially in the Southern Circle, has been devoted to the examination of this subject and to correspondence with various firms providing oil-engines, cotton gins, sugar-cane machinery, oil-mills, rice hullers, etc.

The subject is really rather beyond the province of a Deputy Director and the time is approaching, if it has not already arrived, when the need of an Agricultural Engineer for the Province will become urgent. In the meantime I have been hoping that immediate requirements might to some extent be met by the appointment of a Director of Industries who, in addition to his work for the promotion of the artisan industries of the towns and the cottage industries of the rural districts which play so important a part in the household economy of the dry zone cultivators, might also be able to spare some time to act as our adviser in agricultural engineering. It has however been decided that a Director of Industries is not at present to be appointed and as a result the development of agricultural engineering may be expected to be somewhat retarded.

CHAPTER VI.

PUBLICATIONS AND SUPPLY OF INFORMATION.

Publications.

28. No cultivators' leaflets were published during the year. The whole of those previously issued are however now under revision, and those found to be obsolete will be discarded. A Bulletin on the Peas and Beans of Burma by Messrs. E. Thompstone and A. M. Sawyer was published and one on the Paddy Pests of Burma by Mr. K. D. Shroff is under preparation. The Burma Agricultural Calendar for 1915-16 was published in Burmese.

Supply of information.

29. Requests for information from the public continually increase and there is no doubt that the Department is gradually securing a larger measure of the confidence of the people. The relations of the Department with the Burma Chamber of Commerce continued to be excellent and I am much indebted to that body for the ready assistance at all times forthcoming from its members.

CHAPTER VII.

MISCELLANEOUS.

Poultry breeding.

30. Poultry breeding was continued on the Mandalay Farm on a small scale but calls for no special comment.

Departmental Conferences.

31. Departmental conferences continued to be held every six months and I have already, earlier in this report, laid stress upon their increasing value for co-ordinating the work of all branches. The Registrar of Co-operative Societies has been present at each meeting and this fact, as in past years, has greatly helped to cement the close relations existing between the two Departments.

A new departure was made during the year with useful results by the holding of a meeting of Assistants for the reading of papers and the discussion of them.

Conclusion.

32. The work of all officers has again been exemplary and the Department is extremely fortunate in the possession of its three members of the superior staff, Messrs. Thompstone, Warth and McKerral. The thanks of the Department are also due to district officers for their ready compliance with the many requests for assistance made to them during the year.

H. CLAYTON,

MANDALAY, *the 9th August* 1915. *Director of Agriculture, Burma.*

APPENDICES.

PAGE

APPENDIX I.—Statement of receipts and expenditure for experimental cultivation during 1914-15. 12

APPENDIX II.—(i) Administration Report of the Mandalay Agricultural Station for 1914-15. 13

(ii) Administration Report of the Padu Agricultural Station for the year 1914-15. 19

(iii) Administration Report of the Bugyi Experimental Plot for the year 1914-15. 20

(iv) Administration Report of the Hopin (Ywathitgyi) Experimental Station for the year 1914-15. *ib.*

(v) Administration Report of the Agricultural Stations under the Deputy Director of Agriculture, Southern Circle, for the year ended 30th June 1915. 22

APPENDIX III.—List of implements sold from the Implement Depôt, Mandalay Agricultural Station. 27

APPENDIX I.

Receipts and Expenditure for experimental cultivation during the year 1914-15 *exclusive of the Agricultural stations.*

No.	Stations.	Budget allotment.	Receipts from the sale of produce.	Expenditure.					Total.
				Establishment.	Purchase of seed and fruit trees.	Upkeep of gardens, fencing and trenching.	Purchase of live stock and agricultural implements.	Miscellaneous contingencies.	
1	2	3	4	5	6	7	8	9	10
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Chin Hills (Falam)	1,010	485	540	98	..	...	284	922
2	Myitkyina	1,403	29	918	...	36	...	..	954
3	Distribution of seed from headquarters.	2,500	...	...	2,282	...	...	...	2,282
4	Distribution of agricultural implements.	500	...	...	...	...	200	...	200
5	Purchase and hire of cattle ...	500	...	...	..	...	150	...	150
	Total ..	5,913	514	1,458	2,380	36	350	284	4,508

APPENDIX II.

ADMINISTRATION REPORT OF THE MANDALAY AGRICULTURAL STATION FOR THE YEAR ENDED 30TH JUNE 1915.

I. *General.*—An area of about 1½ acres was allotted for the club and recreation ground of the staff and assistants under training and an area of 5 acres was made over from the dry crop land to the breeding plots for paddy, otherwise the areas under cultivation remain the same as last year.

A number of new plots have been prepared and are being tested for equality preparatory to starting new experiments. The General Report printed separately gives an account of the experimental and other work carried out during the year.

The season was not a very favourable one. The rainfall was very badly distributed—particularly the late rains—and many crops, especially the cold season crops, suffered from drought and flooding alternately. Considerable damage was also done by strong winds to tall-growing crops.

The Natywagon sub-station formed part of the farm for administration purposes and the expenditure is included in that given below.

Padu station, Hopin station and Bugyi sub-station have now got separate grants but have been managed without extra staff. They are each in charge of a sub-overseer from Mandalay who visits them as occasion requires.

II. *Staff.*—The changes in the staff have been as follows :—

Maung Ba Kin was appointed probationer with effect from the 16th July 1914 in place of Maung Po Oh who reverted to the Settlement Department. But Maung Ba Kin did not join his appointment and Maung Ba Than, apprentice, was appointed probationer with effect from 20th August 1914. Maung Tha, acting Sub-overseer, reverted to his original appointment on 11th September 1914. Maung Po Myat was granted six months' extension of leave on medical certificate from 11th September 1914, and Maung Po Min, Sub-overseer, officiated as overseer with Maung Ba Tu, probationer, in place of Maung Po Min. Maung Ba Tin, an outsider, was appointed temporary probationer on 16th September 1914 in place of Maung Ba Tu. On 1st October Maung Sein, apprentice, was appointed probationer *vice* Maung Ba Than, who reverted to the position of apprentice.

Maung Po Myat returned to duty on 1st February 1915 and Maung Po Min and Maung Ba Tu reverted to their substantive appointments. Maung Ba Tin reverted to the position of apprentice on the same date.

Maung Sein, probationer, was granted leave on medical certificate for three months from 8th February. He returned to duty on 7th May 1915.

Maung Tin, Sub-overseer, was granted privilege leave for three months from 1st April 1915. Maung Ba Tu officiated as Sub-overseer and Maung Ba Than, apprentice, was promoted to the position of probationer in place of Maung Ba Tu. Maung Tin returned to duty on 1st July and the other two officers reverted to their substantive appointments.

Maung Ba Tu took privilege leave owing to illness for one month and five days and leave without allowance for 25 days with effect from 4th May 1915 and Maung Sein on his return from leave on 7th May officiated as Sub-overseer. Maung Ba Tin was again appointed officiating probationer on 8th May in place of Maung Sein, promoted.

Maung Po Myat was deputed to Yawnghwe Farm with effect from 2nd April 1915 and his place remained vacant for the rest of the year.

Two Probationary District Agriculturists, Maung Thin Nya and Maung Pauk Sa, completed their training and after taking a month's privilege leave they were posted to Kyaukse and Mandalay Districts respectively.

Maung Ba Maung, Probationary Assistant, continued his training on the Farm and Maung Ba, Probationary Sub-overseer, joined for training on 13th October 1914. These men are both under training for the Yawnghwe Farm.

From Co-operative Credit Societies five men came for some training in seed selection and cultivation and at the present time we have three men undergoing a similar course. These men are generally very useful during the busy seasons.

III. *Housing and Sanitation.*—The housing conditions are far from satisfactory. The new Mandalay drain is not yet open and the housing area is often a swamp. The conditions under which many of the workmen live cannot be changed.

Illness, especially fever, has been very prevalent though there has fortunately been no death.

IV. *Labour.*—There is nothing new under this head. The conditions remain as last year except that the difficulties have become more acute.

V. *Water-supply.*—This is now satisfactory. The electric motor and compressor are both working well. We continue to supply the Police School, Court Houses, etc., and the Military Police have also been supplied for the greater part of the year. There has been

no great saving of cost but that is because the compressor has not yet been made to work as economically as it might do. The matter is under consideration by the Executive Engineer.

VI. *Cattle.*—Four old bullocks were replaced by younger ones. Hence the numbers remain the same. A system of ear-marking and registering of the cattle has been adopted, from which it is hoped to obtain some useful data on working bullocks.

The cattle sheds are becoming very faulty and require attention. The accommodation is still inadequate. There have been no signs of contagious diseases and very little other illness among the bullocks.

Fodder was plentiful and a considerable quantity of straw was sold though the price was low. There is a good deal in stock at present.

VII. *Implements, Machinery, etc.*—There is little to report under this head. The work has been continued as before but arrangements have been made to hand over as much of the business of the depôt as possible to Cowie & Co., who will maintain a stock of suitable implements in Mandalay. A bad year of unfavourable prices of produce appears to be responsible for a reduction in the demand for implements.

The small bullock threshers are most satisfactory, and the rice huller is most useful for the experimental work for which it was obtained.

The seed cleaner is a most successful and useful machine for turning out really good seed.

VIII. *Seed and Produce.*—Plant-breeding, seed selection, production and distribution continue to increase in importance. There is a steadily increasing demand for pure and good seed which it is often impossible to supply. Improved varieties are, however, increasing and it is hoped that before long we shall be able to supply the demand in full. The greater part of the farm is now under selected crops of one variety or another, and in the future we shall have to make use of societies and others outside the farms for multiplication of improved strains. In some places we have already made a start in this direction.

IX. *Accounts.*—The war has very materially affected the receipts for the year and to some extent the expenditure. Most of the produce was sold at rates which were from 30 per cent. to 50 per cent. below those of last year.

Statements showing Receipts and Expenditure and the Balance Sheet of the Implement Depôt are attached.

E. THOMPSTONE,

MANDALAY, *dated* 31*st July* 1915. *Deputy Director of Agriculture, Northern Circle, Burma.*

Statement showing receipts of the Agricultural Station, Mandalay, for the year ended 30th June 1915.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SALE OF FARM PRODUCE.		
Paddy	9,053 5 0	
Gram	374 3 4	
Wheat	11 0 0	
Oats	31 0 0	
English vegetable seeds	112 10 6	
Castor seeds	19 6 0	
Pe-byu-gyi	4 0 0	
Pyaung seeds	22 5 0	
Mat Pe	28 14 4	
Pyaung or jowar stalk	131 15 3	
Paddy straw	253 12 0	
		10,042 7 5
Value of implements distributed :—		
Sale of implements	64 12 0	
		64 12 0
Value of seeds distributed :—		
Seeds distributed free	243 6 10	
Seeds sold to Co-operative Credit Societies not yet paid for ...	319 8 0	
		562 14 10
Hire of winnowing machine	24 0 0	
Hire of farm carts	22 6 0	
		46 6 0
		10,716 8 3
Value of produce on hand :—		
Paddy	668 4 0	
Gram	851 1 0	
Wheat	20 12 0	
Oats	12 0 0	
Cotton	2 8 0	
Linseed	40 0 0	
Peseinngon	6 0 0	
Pedinet	2 14 0	
Pyaung or jowar stalk	1,125 0 0	
Paddy straw	624 0 0	
Paddy used by Farm	180 0 0	
Pyaung seed used by Farm	120 0 0	
Miscellaneous	102 0 0	
		3,754 7 0
GRAND TOTAL ...		14,470 15 3

Statement showing the expenditure of the Agricultural Station, Mandalay, for the year ended 30th June 1915.

—	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SUPPLIES AND SERVICES*.		
Wages for Farm maistries and coolies	11,357 6 8	
Feed and upkeep of stock	1,637 13 6	
Purchase of seed and fruit trees	481 0 5	
Upkeep of garden fencing and trenching	2,129 2 5	
Purchase of livestock and agricultural implements	1,296 5 1	
		16,901 12 1
Contingencies—		
Service postage and telegram charges	25 0 0	
Purchase of furniture	24 0 0	
Freight, shipping and landing charges	177 1 2	
Office expenses and miscellaneous	946 3 3	
		1,172 4 5
GRAND TOTAL ...	.....	18,074 0 6
* Includes labour expended for Agricultural Chemist, Burma ...	85 5 0	
* Includes labour expended for Economic Entomologist, Burma ...	320 0 0	
* Includes labour expended for Assistant Botanist, Burma ...	15 0 0	

Implement Depôt Balance Sheet.

Date.	Expenditure.	Rs. A. P.	Rs. A. P.
3rd April 1914	Drawn on Treasury voucher No. 7.	613 12 3	
28th April 1914.	Drawn on Treasury voucher No. 92.	153 0 0	
18th May 1914	Drawn on Treasury voucher No. 83.	664 7 3	
25th June 1914.	Drawn on Treasury voucher No. 123.	660 0 5	
13th July 1914	Drawn on Treasury voucher No. 47.	374 10 0	
20th August 1914.	Drawn on Treasury voucher No. 94.	68 0 0	
7th September 1914.	Drawn on Treasury voucher No. 26.	758 0 0	
21st September 1914.	Drawn on Treasury voucher No. 84.	900 10 0	
23rd October 1914.	Drawn on Treasury voucher No. 85.	74 10 0	
6th January 1915.	Drawn on Treasury voucher No. 14.	407 0 0	
23nd February 1915.	Drawn on Treasury voucher No. 92.	63 8 0	
30th March 1915.	Drawn on Treasury voucher No. 118.	163 6 0	
			4,900 15 11
	Add value of implements on hand on 31st March 1914.	...	2,091 15 4
	Total expenditure...	...	6,992 15 3
	* Balance (excess of receipts over expenditure).	...	213 2 0
	Total ...	...	7,206 1 3

* The selling price exceeds the cost price by a small percentage calculated to cover cost of handling, etc.

Date.	Receipt.	Rs. A. P.	Rs. A. P.
2nd April 1914.	Credited into Treasury, *vide* chalan No. 2.	75 0 0	
Do.	Credited into Treasury, *vide* chalan No. 3.	78 0 0	
Do.	Credited into Treasury, *vide* chalan No. 4.	46 0 0	
Do.	Credited into Treasury, *vide* chalan No. 5.	26 0 0	
9th April 1914.	Credited into Treasury, *vide* chalan No. 12.	125 0 0	
22nd April 1914.	Credited into Treasury, *vide* chalan No. 28.	125 0 0	
29th April 1914.	Credited into Treasury, *vide* chalan No. 39.	27 8 0	
8th June 1914	Credited into Treasury, *vide* chalan No. 2.	125 0 0	
11th June 1914.	Credited into Treasury, *vide* chalan No. 6.	26 8 0	
Do.	Credited into Treasury, *vide* chalan No. 7.	87 0 0	
18th June 1914.	Adjusted by book transfer by Director.	260 0 0	
25th June 1914.	Credited into Treasury, *vide* chalan No. 14.	53 0 0	
3rd July 1914	Credited into Treasury, *vide* chalan No. 2.	87 0 0	
Do.	Credited into Treasury, *vide* chalan No. 3.	124 0 0	
23rd July 1914.	Credited into Treasury, *vide* chalan No. 5.	125 0 0	
Do.	Credited into Treasury, *vide* chalan No. 6.	125 0 0	
Do.	Credited into Treasury, *vide* chalan No. 7.	125 0 0	
17th August 1914.	Credited into Treasury, *vide* chalan No. 2.	26 0 0	
Do.	Credited into Treasury, *vide* chalan No. 3.	26 8 0	
27th August 1914.	Credited into Treasury, *vide* chalan No. 4.	39 0 0	
9th September 1914.	Credited into Treasury, *vide* chalan No. 1.	26 8 0	
Do.	Credited into Treasury, *vide* chalan No. 2.	6 8 0	
Do.	Credited into Treasury, *vide* chalan No. 3.	27 0 0	
30th September 1914.	Book transfer ...	62 0 0	
20th October 1914.	Credited into Treasury, *vide* chalan No. 2.	95 0 0	
4th November 1914.	Credited into Treasury, *vide* chalan No. 1.	77 0 0	
10th November 1914.	Credited into Treasury, *vide* chalan No. 2.	123 0 0	
18th November 1914.	Credited into Treasury, *vide* chalan No. 4.	135 0 0	
19th November 1914.	Credited into Treasury, *vide* chalan No. 5.	9 8 0	
4th December 1914.	Credited into Treasury, *vide* chalan No. 1.	160 0 0	
7th December 1914.	Credited into Treasury, *vide* chalan No. 3.	9 8 0	
6th January 1915.	Credited into Treasury, *vide* chalan No. 1.	118 0 0	
7th January 1915.	Credited into Treasury, *vide* chalan No. 3.	35 0 0	
2nd February 1915.	Credited into Treasury, *vide* chalan No. 1.	47 0 0	
4th February 1915.	Credited into Treasury, *vide* chalan No. 2.	150 0 0	
8th February 1915.	Credited into Treasury, *vide* chalan No. 4.	70 0 0	
Do.	Credited into Treasury, *vide* chalan No. 5.	144 0 0	
Do.	Credited into Treasury, *vide* chalan No. 6.	26 0 0	
10th February 1915.	Credited into Treasury, *vide* chalan No. 8.	195 0 0	
15th February 1915.	Credited into Treasury, *vide* chalan No. 13.	50 0 0	
17th February 1915.	Credited into Treasury, *vide* chalan No. 18.	35 0 0	
Do.	Credited into Treasury, *vide* chalan No. 14.	185 8 0	
19th February 1915.	Credited into Treasury, *vide* chalan No. 15.	48 0 0	
23rd March 1915.	Credited into Treasury, *vide* chalan No. 35.	15 8 0	
26th March 1915.	Credited into Treasury, *vide* chalan No. 42.	70 0 0	
Do.	Credited into Treasury, *vide* chalan No. 43.	26 8 0	
29th March 1915.	Credited into Treasury, *vide* chalan No. 47.	48 0 0	
30th March 1915.	Credited into Treasury, *vide* chalan No. 48.	41 8 0	
Do.	Book transfer ...	180 0 0	
Do.	Do. ...	125 0 0	
31st March 1915.	Do. ...	94 0 0	4,164 8 0
	Less value of implements sold for which cash was received after 31st March 1914.	...	770 0 0
	Total ...	...	3,394 8 0
	*Add value of implements in stock.	...	2,478 5 3
	Add value of implements sold for which cash has not yet been received.	...	1,333 4 0
	GRAND TOTAL ...	...	7,206 1 3

* Calculated at cost price only. List attached.

List of Implements in stock on 31st March 1915.

Serial No.	Name of Implements.	Number of Machines.	Value.	Remarks.
1	2	3	4	5
			Rs. A. P.	
1	"Raja" chaff cutter	8	400 0 0	
2	Chindwin chaff cutter	1	46 0 0	
3	Knives for chaff cutter	10	21 4 0	
4	Spare gears for chaff cutter	16	102 0 0	
5	New Cyprus plough	8	206 0 0	
6	Spare shares for above	23	86 4 0	
7	No. I Beeloo plough	3	70 8 0	
8	Spare Shares for above	58	54 1 3	
9	No. III Beeloo plough	3	101 4 0	
10	No. III Spare shares for above	12	16 8 0	
11	I. N. D. plough	4	52 0 0	
12	Spare shares for above	12	36 0 0	
13	Gwinset		79 8 0	
14	Pulley wheel	1	20 0 0	
15	No. 1 winnower	1	125 0 0	On trial at Pwinbyu.
16	No. 4 winnower	1	405 0 0	
17	No. 5 winnower	2	580 0 0	
18	Riddles, No. 1	3	Set 151 0 0	
19	Riddles, No. 2	1		
20	Riddles, No. 3	1		
21	Riddles, No. 4	1		One on trial at Shwebo.
22	Chain Pumps	2	120 0 0	
	Total ...	...	2,478 5 3	

ADMINISTRATION REPORT OF THE PADU AGRICULTURAL STATION FOR THE YEAR 1914-15.

General.—This is the first report of this station which was opened at the beginning of the year. The whole area—3·69 acres of upland red soil and 20 acres of black wheat soil—was under cultivation with the exception of the roads and three-fourths acre of upland under buildings and threshing floors. The main area of black soil was under wheat, gram and oats, and the upland area was occupied by cotton, *pyaung*, sesamum, *peseinngon*, groundnuts, *pebyugyi* and castors. The farm being small the greater part of the land was under experiment, the objects and results of which are given in the General Report of the Station.

Season.—The season was not a very good one for most of the crops, but they all succeeded except sesamum, for which the year was a particularly bad one. The success of some of the other crops in spite of adverse climatic conditions was no doubt due to the method of cultivation adopted, *viz.*, deep ploughing and frequent stirring of the surface soil. The late rains were poor and much damage was done by strong winds.

Staff.—There is no staff permanently attached to this farm. It was in charge of a coolie *gaung* only and supervised by Sub-overseer Maung Po Min, from Mandalay Farm, who deserves credit for the excellent manner in which the work entrusted to him was carried out. He paid frequent visits and at times when important work was in progress, his stay was extended to several days.

Labour.—The labour employed consisted only of one coolie *gaung* on Rs. 18 per month, 1 cooly on Rs 15 per month and 2 coolies on Rs. 7-8-0 each per month and during the sowing and harvesting season, a little extra outside labour.

Buildings are cheaply made of bamboo mat roofed with corrugated iron and consist of 3 coolie quarters, a seed godown, a shed for cattle and implements and a shed for threshing and winnowing.

Cattle consist of 2 pairs of bullocks bought locally. They are healthy and in good condition. They are fed principally on the broken up wheat straw *gyon-hmàw*.

The water-supply of the village and farm is very bad indeed. During the rainy season it is muddy tank water and in the dry weather the brackish water from wells in the dried up lake bottom. The water level in the soil is said to be very deep and it would cost a considerable sum to sink wells.

Implements.—Cyprus ploughs and a Planet Junior Cultivator are used and worked very well on both kinds of soil. The other European implements are chaff-cutters, winnowers and a small bullock thresher which does very good work with wheat and gram.

A few implements, *e.g.*, chaff cutters, have been sold from the farm and supplied by the Mandalay Implement Depôt.

Seeds and Produce.—Seed selection work formed the chief part of the programme of this station. Wheat, gram and cotton are at present being selected. Very little seed had been distributed up to the end of the year, but the whole produce of the station has been stored for seed purposes and much more than this in the case of wheat, has been applied for by societies and individual cultivators. A little *pyaung* and *peseinngon* has been distributed. The latter crop was particularly successful and is expected to become in time a most important crop for the upland soils.

Accounts.—The expenditure amounted to a total of Rs. 3,380-1-4 as detailed below.

As all the produce has been stored for seed purposes there were no receipts during the year. The value of the seed when sold will fall into next year's accounts.

Statement of Expenditure incurred on the Padu Agricultural Station.

(*a*) The initial expenditure amounted to Rs. 2,282-4-5.

(*b*) The recurring expenditure is as follows:—

	Rs.	A.	P.
Supplies and Services—			
Wages of coolies	434	0	0
Feed and upkeep of stock	80	12	0
Purchase of seed and fruit trees	39	12	0
Upkeep of gardens	68	1	0
Purchase of live stock and agricultural implements ...	61	9	0
Petty construction and repairs	293	5	10
Contingencies—			
Freight, shipping and landing charges	6	6	0
Office expenses and miscellaneous	113	15	1
Total ...	1,097	12	11

ADMINISTRATION REPORT OF THE BUGYI EXPERIMENTAL PLOT FOR THE YEAR 1914-15.

This plot 3⅛ acres in extent was started in 1912, and until this year was treated as a sub-station of Mandalay farm. An account of the work carried out there up to the present may be found in the Mandalay Agricultural Station Reports for 1913 and 1914. As there is now a small budget grant of Rs. 700 for this plot a separate Administration Report is required.

The whole area was under cultivation, as in previous years, with the exception of the plot occupied by the coolie-gaung's hut and cattle shed, and trials of the same crops were repeated.

The season was a good one for paddy but for dry crops the rainfall was badly distributed and precarious. A good paddy season detracts from the attention paid to the plot by cultivators of the neighbourhood. Hence a great deal of interest was not taken in work last year. The results are, nevertheless, satisfactory as shown by the applications for seed—especially of *peseinngon*.

The plot is in charge of and worked by a coolie-gaung and his wife, supervised by a visiting sub-overseer from Mandalay with the aid of the District Agriculturist, Shwebo.

The buildings are an ordinary mat hut with a *wagat* roof. Half of this hut is occupied by the coolie-gaung and his family and the other half is a room for storing seed, etc. At one end is a shed for the pair of bullocks. The bullocks are both young and are in good condition. There is plenty of pasturage and fodder.

With the exception of Cyprus ploughs and a hand chaff cutter the ordinary Burmese implements are in use.

The plot is worked under the close inspection of the local co-operative credit societies and the principal work has been the trial of new crops, rotations and methods of cultivation for the dry upland soils. Considerable success has been attained, *e.g.*, with *peseinngon*, of which a fair quantity of seed has been distributed and which is likely to become an important crop in this dry area. (See General Report). The seed was the Mandalay selected strain and was sent from the Central Agricultural Station, Mandalay. Bugyi plot itself is too small to undertake the work of a seed-farm. So arrangements are being made with the local societies to grow seed of selected strains.

Small quantities of other kinds of seed have also been distributed and methods of cultivation have been demonstrated to those who were interested.

Accounts.—The total expenditure for the year amounted to Rs. 242-1-0 as detailed below. The small amount of produce obtained is transferred to the Central Station, Mandalay, and distributed from there—except in the case of a few seeds distributed free—hence no receipts are credited to this plot.

Expenditure on Bugyi plot for the year 1914-15.

	Rs.	A.	P.
" Office expenses and miscellaneous	20	5	0
" Wages of coolies	165	0	0
" Feed and upkeep of stock "	56	12	0
Total ...	242	1	0

ADMINISTRATION REPORT OF THE HOPIN (YWATHITGYI) EXPERIMENTAL STATION FOR THE YEAR 1914-15.

General.—This small station of 15·81 acres in extent was established in 1914. It is conveniently situated along the railway to Myitkyina about half a mile to the south of Hopin Railway Station, Myitkyina District, and has for its chief objects:—

(i) The trial and, if successful, the introduction of bread wheat (Triticum vulgare) into the Mohnyin-Mogaung valley.

(ii) The trial and introduction of other paying crops.

(iii) Seed selection and distribution.

(iv) Minor experiments—including environment experiments for Agricultural Chemist.

The soil of this extensive valley varies from a grey to sandy loam crossed by low ridges of lighter sandy soil. In many places it is rich in organic matter and appears to be fertile. The valley is well watered and drained, and slopes gradually from the west to the Mohnyin stream on the east. The soil of the farm is typical of that of the tract and includes both the loam and some of the sandy ridges.

The climate is good but at most times of the year the atmosphere is damp. The rainfall is fairly heavy but not generally sufficient, unless supplemented by irrigation, for a full crop of paddy—at present practically the only crop grown by the cultivators. The population is sparse but rapidly increasing by immigration.

Wheat seed was supplied by the department, to the Ywathitgyi Co-operative Credit Society, in 1912 and succeeded very well, but, owing to difficulties experienced in threshing its cultivation did not spread. Moreover, from the Myitkyina Experimental Garden some excellent yields of wheat were obtained, *e.g.*, 40 baskets (2,800 lbs.) per acre in 1912-13 and 32 baskets (2,310 lbs.) in 1913-14. This indicates that wheat could be successfully grown and as irrigation is possible only on very limited areas and paddy consequently an uncertain crop, the cultivators (especially the members of societies) are willing and anxious to grow any other crops that can be made to pay. The almost complete failure of most of the paddy crop during the past year greatly increased the interest taken in the work being done on the station.

The high price of labour and heavy freight charges greatly reduce the profits to be made on paddy, whilst for wheat (and some other crops) there is a market for a large quantity almost on the spot—police supplies to Myitkyina alone include an importation of 350,000 lbs. of wheat per annum—and any surplus being, weight for weight, more valuable than paddy would cost less to export.

(2) *Staff and Labour.*—There is no permanent staff. The work is done by a coolie-*gaung* on Rs. 20 per month and two coolies on Rs. 15 each per month supervised by a visiting sub-overseer from Mandalay Farm, who extends his stay at times when important work is in progress. Owing to the distance from Mandalay the arrangement is not a satisfactory one and proposals have been put forward to employ a permanent Sub-overseer.

(3) *The buildings* are cheaply made of bamboo mat with *wagat* roofs. They consist of a coolie-*gaung's* hut, a small seed-store, a shed for the cattle and one for threshing and winnowing.

(4) *Cattle.*—Two pairs of bullocks have been bought locally. They are fed on the abundant pasturage around the farm.

(5) *Implements.*—The "Beeloo" plough is preferred in this area for breaking up the rough land. It is therefore used on the farm and a number have been sold from the Mandalay Depôt to cultivators in the neighbourhood. Except for a chain pump and a winnowing machine the other implements in use are of the ordinary Burmese type.

THE WORK OF THE YEAR 1914-15.

(6) The principal work carried out during the year has been to clear some of the land of the thick "kaing" grass and scrub jungle with which it was covered and to lay out and prepare some plots for experimental work. The rough ploughing, which was all that could be done the first season, did not result in a very good seed bed and further preparation made sowing late for most crops.

(7) The season 1914-15 was a very unfavourable one for all crops. Most of the paddy in the neighbourhood was almost a failure and many of the other crops grown on the farm were little better. The rainfall was badly distributed and strong winds did much damage. The late rains, which are said to be generally very good in this valley, failed completely but came on heavily at the end of February and in March when the produce was ripening and destroyed most of the crops which had survived the earlier drought.

(8) The crops tried were as follows:—

Paddy was planted in eight small plots only in order to try some pure lines from Mandalay and for the Agricultural Chemist's environment experiments. It grew well for a time but produced no fertile heads owing to late planting and dry weather.

(*b*) *Wheats.*—Two varieties from India (Pusa 6 and Pusa 12) supplied by the Imperial Economic Botanist and another exotic (E 003 Prelude) gave insignificant yields of grain and may be regarded a failure this year. Three other imported varieties, *viz.*, E 004, E 011, and E 012, yielded straw but no grain. Our own selected Shan States strains five of which were tried, succeeded a little better but were almost destroyed by the rains at harvest time.

The sowing of all the varieties was late but an effort will be made to get the seed into the ground earlier next season.

(*c*) *Oats*, barley and linseed were each sown on small plots, but met the same fate as the wheat.

(*d*) *Peseinngon* was sown in a small plot on the high land. It yielded at the rate of 705 lbs. per acre, which, considering the lateness of sowing, appears to be a very fair yield.

(*e*) *Groundnuts* on the high sandy land gave a return of over 4,500 lbs. per acre. This is an exceptionally high yield obtained from a small carefully-tended plot. It will be tried on a larger scale next year.

(*f*) *Pe-byu-gyi* on the high land, gram and peas (sadaw-pe) on the main area, were sown as rotation crops and in case of the peas, for selection work. *Pe-byu-gyi* did not succeed well, whilst gram and peas, though they flourished at first, were affected by late sowing and afterwards by unfavourable conditions.

(*g*) The "*Tepary*" bean, a new variety (Phaseolus acutifolius, var. latifolius, Freeman) from America, gives promise of success, though the yield this year was only fair.

(9) *Seeds and Produce.*—The produce is small and will all be retained for seed purposes or transferred to the Central Station, Mandalay. Hence there is none for sale. A little seed has been distributed but it was sent up from the Central Station.

(10) Statement showing expenditure of the Hopin Agricultural Station 1914-15.

	Rs.	A.	P.
(*a*) *Initial expenditure*	1,013	11	0
(*b*) *Recurring expenditure.*			
Supplies and Services—			
Wages of coolies	512	0	0
Upkeep of garden	00	3	0
Purchase of livestock and agricultural implements	823	9	3
Petty construction and repairs	258	4	0
Contingencies—			
Freight, shipping and landing charges	48	6	0
Office expenses and miscellaneous	141	9	0
Total .	2,857	10	3

ADMINISTRATION REPORT OF THE AGRICULTURAL STATIONS UNDER THE DEPUTY DIRECTOR OF AGRICULTURE, SOUTHERN CIRCLE, FOR THE YEAR ENDED 30TH JUNE 1915.

General.—The stations under my control during the year were Hmawbi, Tatkôn and Pwinbyu. The programmes of work for these stations were in each case maintained. At Hmawbi an area about 4 acres of upland land has been laid out near the building site and cropped with green manures. It is proposed to try tobacco on this area during next cold weather season. In the case of the other two stations the area remained unchanged. The areas now worked by the department in each case are as follows:—

Hmawbi (Insein District 163 acres and 188 acres rented out by the Hmawbi Ywama Co-operative Credit Society; Tatkôn (Yamèthin District) 40 acres; Pwinbyu (Minbu District) 11·85 acres.

Programmes of work on the Station.—The Hmawbi Station is intended to deal with the improvement of Lower Burma paddy as its chief object. In accordance with this object a series of permanent manurial experiment is maintained and a temporary series has also been initiated. The results of these will be published in the Special Farm Report. Certain experiments in cultivation methods are also being carried out. The main work, however, is the production by selection or otherwise of new and improved strains of paddy. Ten new strains have been produced on a field scale during the year and sent for valuation to the Rangoon Chamber of Commerce. The Report of the Chamber is favourable and states that some of the types are of first class quality for export to Europe while others are suitable for local use and export to India. Twelve new types are now under selection as well as the progeny of certain hybrids.

At Tatkôn the programme of work was maintained throughout the year and selection work with indigenous cotton, with maize, castor and sesamum have been put in hand. As the year under report was the first year of the station it is too early to make any comment on the result of the work. A large number of selections, however, have been made on the case of each of these crops and are now being grown and tested.

At Pwinbyu sugarcane sets to the value of Rs. 1,200 were distributed during the year to cultivators and members of Co-operative Credit Societies. As a result there is at present growing, as a beginning of cane cultivation in the locality, about 40 acres of cane in the Môn Canal tract. A man was brought from Pyinmana to demonstrate jaggery boiling and the demonstration was attended by representatives from 17 co-operative credit societies which are taking up sugarcane growing. Trials with different paddy varieties were also maintained. Cambodia cotton was grown and a small amount of seed distributed. This crop is spreading in the vicinity of Pwinbyu.

Staff.—There was no change of staff on any of these stations throughout the year. At Hmawbi Maung Po Ka acted as Superintendent, at Tatkôn Maung Tint while Pwinbyu was under Sub-overseer, Maung Ba II. Mr. R. Beale was Assistant Botanist at Hmawbi during the year under report. Maung Ba I, Overseer, Hmawbi, took three months' privilege leave from 15th December and his place was unfilled during his absence.

Training.—Maung Gale, Assistant under training, remained at Hmawbi up till 27th May when he proceeded to Tatkôn to complete his training there. His progress has been satisfactory and he gives promise of being a useful Assistant.

The following District Agriculturists under training worked on the stations during the year and received training in the methods of plant selection:—Maung Gyi (1), Myingyan, came to Tatkon on 1st April 1914 and left for Hmawbi on 3rd December 1914. Maung Po Saing, Pakôkku, and Maung Po Tun, Thayetmyo, arrived at Hmawbi on 1st April 1914 and left for Tatkôn on 5th December 1914. At Hmawbi Maung Gyi (2), Pegu, came on 2nd January 1915 and Maung Maung, Hanthawaddy, came on 11th March 1915. The two latter are still under training on that station.

Buildings, etc.—The buildings, etc., at Hmawbi have been completed with the exception of some work on roads. They are satisfactory but the fence round them is of very bad construction. A supply of artesian water has been found at 120 feet and a proper pump and distribution system are being installed.

At Tatkôn the buildings sanctioned at a cost of Rs. 11,000 were completed by the Public Works Department during the year. They are *kutcha* with the exception of a machinery shed of corrugated iron. An experimental boring by the Public Works Department discovered a good supply of surface water at a depth of 45 feet but owing to lack of funds no well has been dug as yet. This is a matter that will have to be attended to as the time spent in carting water from streams and other wells can ill be spared.

Rest-houses have been erected both at Hmawbi and Tatkôn and provided with the necessary furniture and crockery.

Equipment.—In connection with seed selection at Hmawbi the necessary balances, bottles, tubes, etc., have been provided and the supply will be increased from time to time as funds permit. The Assistant Botanist at Hmawbi has also a precision balance for delicate work, a Leitz microscope, and a small dissecting microscope. He may therefore be regarded as adequately equipped to a certain extent and other appliances will be added gradually. Similar appliances are badly required at Tatkôn.

An oil-engine and thrasher by Messrs. Ransome, have been installed at Hmawbi. The outfit has given fairly good results. A small hand thrasher by Messrs. Hunt has also been found of much use for dealing with smaller quantities of grain. A hand rice huller and eliminator have been purchased and found of much use for breakage tests.

At Tatkôn a Gardiner 2½ horse power oil-engine and one McCarthy cotton gin have been installed; also a hand press for baling cotton and a winnowing machine. The necessary ploughs and field equipment have also been obtained.

Pwinbyu is stocked with the necessary implements.

Labour.—At Hmawbi rates continue high and annas 10 per day has had to be paid in order to obtain men to do some of the more disagreeable work connected with the making of selection nurseries. Rates for men and coolies usually vary from annas 4 to annas 8 according to the nature of the work, the latter being the prevailing rate.

At Tatkôn the labour and cattle in use now are unequal to the task of cultivating the land, of carting water, and of testing implements, etc. The allotment for this farm is a good deal too small. At Tatkôn the rates are annas 8 for men and annas 6 for women.

At Pwinbyu the rates of labour are usually annas 8 per man. Labour is often very scarce here.

Cattle.—At Hmawbi there were 19 pairs of bullocks and during the year one animal died from unknown causes and will have to be replaced. It is proposed to purchase several pairs of buffaloes to do some of the heavier work connected with experiments.

At Tatkôn 8 pairs of cattle were purchased when the Farm Station was opened. During the year rinderpest broke out resulting in the death of one pair. Another pair was stolen. This loss could have been avoided if a water-supply had existed on the station. The bullocks were lost while being taken to water at the *chaung* about ¼ mile from the farm. These two pairs have been replaced.

At Pwinbyu two pairs are kept and during the year one animal which proved to be a bad doer was sold and replaced.

Accidents and Losses.—In addition to the bullocks stolen at Tatkôn a stack of unthreshed paddy was set fire to at Hmawbi and damage estimated at Rs. 1,500 done. Several other heaps which the culprits also endeavoured to fire fortunately did not go off. No selected paddy was burned. The motive for this act cannot be ascertained and the police have not been able to obtain any information.

Accounts.—The statements of income and expenditure for each of the three stations are herewith attached.

List of Implements distributed by the Deputy Director of Agriculture, Southern Circle, Burma, for the year ended 30th June 1915.

Kind of implements.	No. sold.	Value of each.	Total value.
1	2	3	4
		Rs. A. P.	Rs. A. P.
Plough (Cyprus)	1	29 1 0	29 1 0
Plough (Cyprus)	1	27 2 0	27 2 0
Plough (Cyprus)	1	26 0 0	26 0 0
Plough (Meston)	1	7 6 0	7 6 0
Plough (Meston)	2	7 14 0	15 12 0
Plough (Meston)	4	6 14 0	27 8 0
Plough (Zemindar)	2	27 0 0	54 0 0
Plough (Watts)	2	9 10 0	19 4 0
Plough (Watts)	1	10 0 0	10 0 0
Chain water lifts 5 feet	1	57 8 0	57 8 0
Chain water lifts 7½ „	1	57 8 0	57 8 0
Chain water lifts 10 „	2	59 8 0	119 0 0
Chain water lifts 12½ „	1	64 8 0	64 8 0
Chain water lifts 15 „	1	69 8 0	69 8 0
Chain water lifts 15 „	2	65 8 0	131 0 0
Chain water lifts 15 „	4	67 8 0	270 0 0
Chain water lifts 20 „	1	74 12 0	74 12 0
Chain water lifts 20 „	1	76 4 6	76 4 6
Chain water lifts 25 „	1	79 4 3	79 4 3
Chaff cutter (Rajah)	1	45 0 0	45 0 0
Chaff cutter (Rajah)	12	50 0 0	600 0 0
Chaff cutter (Chindwin)	7	40 0 0	322 0 0
Chaff cutter (Mingyi)	1	65 0 0	65 0 0
Indian bullock gear	2	127 0 0	254 0 0
Settun	1	23 0 0	23 0 0
Jaggery boiling pans	3	29 6 0	88 2 0
Winnower	1	140 0 0	140 0 0
Total ...	58	.....	2,752 7 9

B.—*Statement showing the receipts of Agriculture Station, Hmawbi, during the year ended 30th June 1915.*

—	Amount.	Total.
1	2	3
Sale of farm produce.	Rs. A. P.	Rs. A. P.
1. Paddy*	3,350 12 0	
2. Fruits	21 12 0	3,372 8 0
In addition to the above there were also—		
3. Value of paddy kept for seed	196 4 0	
4. Value of seed supplied to Co-operative Credit Society, Hmawbi ...	175 0 0	
5. Value of seed in stock	36 4 0	407 8 0
GRAND TOTAL ...	.....	3,780 0 0

*About Rs. 1,500 worth of paddy was lost by burning.

Statement showing the Expenditure of the Agricultural Station, Hmawbi during the year ended 30th June 1915.

—	Amount.	Total.
1	2	3
Supplies and Services.	Rs. A. P.	Rs. A. P.
Wages of farm maistries and coolies	6,036 7 8	
Feed and upkeep of stock	133 7 6	
Purchase of seed and fruit trees	108 9 0	
Upkeep of garden, fencing and trenching	2,493 1 11	
Purchase of live stock and implements	2,498 11 0	
		11,270 5 1
Contingencies.		
Service postage and telegram charges	11 8 0	
Purchase of furniture	.....	
Freight, shipping and landing charges	112 10 9	
Purchase of books and periodicals	.....	
Office expenses and miscellaneous	686 11 6	
Rent, rates and taxes	57 12 0	
Pay of menials	36 0 0	
		904 10 3
GRAND TOTAL ...	.....	12,174 15 4

Statement showing the Receipts of Agricultural Station, Tatkôn, for the year ended 30th June 1915.

—	Amount.	Total.
1	2	3
Sale of farm produce.	Rs. A. P.	Rs. A. P.
Madagascar beans	15 0 0	
Sessamum	15 0 0	
Maize	10 0 0	
		40 0 0

Statement showing the Expenditure of Agricultural Station, Tatkôn, for the year ended 30th June 1915.

—	Amount.	Total.
1	2	3
Supplies and Services.	Rs. A. P.	Rs. A. P.
Wages of farm maistries and coolies	2,217 3 8	
Feed and upkeep of stock	59 7 0	
Purchase of seed and fruit trees	94 15 3	
Upkeep of garden, fencing and trenching	.....	
Purchase of live stock and implements	1,226 7 0	
		3,598 0 11
Contingencies.		
Service postage and telegram charges	20 7 6	
Purchase of furniture	287 0 0	
Freight, shipping and landing charges	128 0 0	
Purchase of books and periodicals	.....	
Office expenses and miscellaneous	488 1 3	
Rent, rates and taxes	60 0 0	
		983 8 9
GRAND TOTAL ...	.....	4,581 9 8

Statement showing the Receipts of Agricultural Station, Pwinbyu, for the year ended 30th June 1915.

—	Amount.	Total.
1	2	3
Sale of Farm Produce.	Rs. A. P.	Rs. A. P.
Paddy ...	263 8 0	
Sugar-cane	322 0 0	
Cambodia cotton	13 7 0	
Burmese cotton	8 8 0	
Madagascar bean	10 10 0	
		618 1 0

The total value of cane sets sold to societies during the year was Rs. 1,282-8-4 of which Rs. 960-8-4 is still outstanding.

Statement showing the Expenditure of Agricultural Station, Pwinbyu, for the year ended 30th June 1915.

—	Amount.	Total.
1	2	3
Supplies and Services.	Rs. A. P.	Rs. A. P.
Wages of farm maistries and coolies	712 13 3	
Feed and upkeep of stock	24 11 0	
Purchase of seed and fruit trees ...	35 13 0	
Upkeep of garden, fencing and trenching	4 0 0	
Purchase of live stock and implements	392 15 0	
		1,170 4 3
Contingencies.		
Service postage and telegram charges	6 0 0	
Purchase of furniture	...	
Freight shipping and landing charges	34 9 0	
Purchase of books and periodicals	...	
Office expenses and miscellaneous	128 0 0	
		168 9 0
GRAND TOTAL ...	...	1,338 13 3

A. McKERRAL,
Deputy Director of Agriculture,
Southern Circle, Insein.

APPENDIX III.

List of Implements sold from Implement Depôt, Mandalay Agricultural Station.

No.	Name of Implements.	District.	Number distributed.				Value.		
			Experimental Farm.	Societies.	Individuals	Total.			
1	2	3	4	5	6	7	8		
							Rs.	A.	P.
1	Raja Chaff cutters	Sagaing ...	1	1	1	3	146	0	0
2	Raja Chaff cutters	Mandalay ...	...	3	1	4	200	0	0
3	Raja Chaff cutters	Taunggyi ...	1	...	...	1	50	0	0
4	Mingyi Chaff cutters	Mandalay ...	...	...	3	3	210	0	0
5	Chindwin Chaff cutters	Mandalay ...	...	...	1	1	50	0	0
6	Chindwin Chaff cutters	Sagaing ...	...	1	...	1	48	0	0
7	Mark B. 3 Chaff cutters ...	Mandalay ...	...	...	2	2	220	0	0
8	Knives for Chaff cutters ...	Myingyan ..	...	...	12	12	27	0	0
9	Knives for Chaff cutters ...	Mandalay ...	...	...	10	10	23	0	0
10	Gears for Chaff cutters ...	Kyauksè ...	...	...	2	2	13	0	0
11	Gears for Chaff cutters ...	Yamèthin ...	6	...	...	6	39	0	0
12	No. 1 Winnowing machine ...	Mandalay ...	...	1	...	1	125	0	0
13	No. 1 Winnowing machine ..	Myitkyina ...	1	...	...	1	125	0	0
14	No. 1 Winnowing machine ..	Toungoo ...	...	1	...	1	130	0	0
15	No. 1 Winnowing machine ...	Shwebo ...	...	...	1	1	125	0	0
16	No. 3 Winnowing machine ...	Myitkyina ...	...	1	...	1	195	0	0
17	Chain pump	Shwebo ...	...	...	2	2	139	0	0
18	Chain pump	Mandalay ...	1	...	2	3	186	0	0
19	Chain pump	Katha ...	...	...	2	2	144	0	0
20	Chain pump	Pakôkku ...	...	2	...	2	118	0	0
21	Bullock gear pump	Mandalay ...	...	...	1	1	223	0	0
22	Bullock gear pump	Katha ...	...	1	...	1	322	0	0
23	Bullock gear	Mandalay ...	...	...	2	2	260	0	0
24	Bullock gear	Mônywa ...	...	...	1	1	135	0	0
25	Pulley wheel	Mônywa ...	...	...	1	1	25	0	0
26	No. 1 " Beeloo " plough... ...	Myitkyina ...	1	...	...	1	26	0	0
27	No. 2 " Beeloo " plough	Myitkyina ..	1	...	...	1	32	0	0
28	No. 2 " Beeloo " plough	Kyauksè ...	...	...	1	1	32	0	0
29	New Cyprus plough	Mandalay ...	...	...	3	3	78	0	0
30	New Cyprus plough	Taunggyi ...	5	...	...	5	130	0	0
31	New Cyprus plough	Pegu ...	...	...	2	2	52	0	0
32	New Cyprus plough	Sagaing ...	...	...	7	7	182	0	0
33	I. N. D. plough	Mandalay ...	...	...	1	1	15	8	0
34	I. N. D. plough	Yamèthin ...	1	...	...	1	15	8	0
35	*Gwinzet*	Mandalay ...	...	...	1	1	26	8	0
36	*Gwinzet*	Yamèthin ...	...	...	3	3	79	8	0
37	*Gwinzet*	Kyauksè ...	...	...	3	3	79	8	0
38	Teeth for *Gwinzet*	Kyauksè ...	...	...	15	15	3	12	0
39	Teeth for *Gwinzet*	Yamèthin ...	...	...	30	30	7	8	0
	Total ...	...	...	...	...	...	4,037	12	0

G. B. C. P. O.—No. 40, D. of A., 26-10-1915—489—J. A. P.

00133917

Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020